Research Report 1374

Utilization of a Vehicle Integrated Intelligence [V(INT)^2] System in Armor Units

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The complexity, sophistication, and lethality of the future battlefield as envisioned in the scenarios of AirLand Battle 2000 require the development of vehicle integrated intelligence [V(INT)^2] systems for armor units. A critical component in the design and development of the V(INT)^2 system is the determination of the volume, format, and level of battlefield information needed by commanders at different levels of combat support. This report analyzes and describes the functional and informational requirements unique to each of the following echelons: battalion, company, platoon, (continued)

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20. (continued)

and individual armored vehicle. In support of these requirements, the capabilities of V(INT)^2 for the acquisition, transmission, and interpretation of battlefield information are identified and illustrated. The doctrinal implications of V(INT)^2 for combat vehicles are suggested, and substantiate the system's potential for a revolutionary impact on armor operations. In conclusion, the report provides a foundation for determining the user-oriented guidelines and hardware specifications required for the design and development of the V(INT)^2 system architecture. (Keywords:

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FOREWORD

The Small Unit Training Team of the Army Research Institute for the Behavioral and Social Sciences (ARI) performs research and development in areas that include command, control, and communication (C^3) procedures and requirements within armor units and combined arms forces. Of special interest is research in the area of vehicle integrated intelligence [$V(INT)^2$] systems. A primary task in the development of these systems is the determination of the unique battlefield information requirements of armor personnel at each level of combat command support.

This report provides the preliminary requirements analysis and structure for the development of complex vehicle intelligence systems as tailored to each unit's unique areas of influence and interest. In addition the report describes the informational transactions and processing required to fuse these various units into an integrated combat intelligence network.

Further development of this front-end analysis will lead to the user-oriented guidelines and hardware specifications necessary for the design and development of the $V(INT)^2$ system architecture. The doctrinal implications outlined in this report suggest that $V(INT)^2$ may prove to be one of the most powerful and effective technological advancements in the history of armored vehicles.

EDGAR M. JOHNSON
Technical Director

UTILIZATION OF A VEHICLE INTEGRATED INTELLIGENCE [$V(INT)^2$] SYSTEM IN ARMOR UNITS

EXECUTIVE SUMMARY

Requirement:

To specify the doctrinal implications for small unit armor vehicles operating on the battlefield and equipped with integrated intelligence systems.

Procedure:

The functional requirements and capabilities of vehicle integrated intelligence [$V(INT)^2$] systems for small armor units were defined by a thorough analysis of the military doctrine and literature related to these units. The springboard for this effort was the operational concept paper on $V(INT)^2$ documented and approved by the Armor Center and included in this report to guide future developments. In addition the battlefield operations described in this report are informed by the conceptualizations of the future close combat vehicle (FCCV) and the scenarios of AirLand Battle 2000.

The doctrinal implications of $V(INT)^2$ detailed in this report exploit the high rates of information acquisition, exchange, and processing made possible by current and future technological innovations. The operational capabilities of $V(INT)^2$ depicted are based on a thorough review of current and projected technological developments in such areas as graphic displays, integrated voice input and output, multi-modal sensors and expert rule-based protocols.

Results:

Specification of the doctrinal implications of $V(INT)^2$ for small armor units has resulted in a detailed breakdown of the functional and informational battlefield requirements tailored to each of the following echelons: battalion, company, platoon, and individual vehicle crew. The report documents how $V(INT)^2$ capabilities will be designed to meet each of these small unit's unique requirements for near real-time battlefield intelligence in relation to their doctrinally sanctioned roles. In addition as the capabilities of $V(INT)^2$ are formulated, its emergence as a force multiplier of nearly unprecedented magnitude is clearly outlined.

The revolutionary capabilities of $V(INT)^2$ may provide the foundation for fundamental changes in the military doctrine of armored combat. The analyses contained in this report suggest what the nature of these changes might be. Selected examples of these potential doctrinal transformations discussed include: the development of a generic data base that subsumes the sometime arbitrary distinctions made between offensive and defensive operations; the fusion of multi-modal sensor inputs into integrated and readily comprehensible intelligence summaries, the lethal leverage realized by secure, precise and instantaneous intelligence communications; the decisive quality of tactical decisions

informed by military expert rule-based protocols; the integrity of military operations realized by V(INT)^2's forging of a true man/machine/mission (M^3) alliance.

Utilization of Findings:

The concepts outlined in this report provide a foundation for the determination of the user-oriented guidelines and hardware specifications required for the design and development of the V(INT)^2 system architecture.

UTILIZATION OF A VEHICLE INTEGRATED INTELLIGENCE [V(INT)^2] SYSTEM IN ARMOR UNITS

CONTENTS

UTILIZATION OF A VEHICLE INTEGRATED INTELLIGENCE [V(INT)^2] SYSTEM IN ARMOR UNITS

INTRODUCTION

The Vehicle Integrated Intelligence V(INT)^2 system marks a significant advance in command and control on the battlefield. The streamlined, accurate, and timely transfer of data allows the battle leader sufficient information to react faster and more effectively than his opponent. The V(INT)^2 will be found in some form in virtually every combat element from the division down to the individual vehicle. How those organizations fight the battle is found in the appropriate Field Manuals. How they may use the V(INT)^2 to accomplish their tasks is outlined in this document.

Users of this document are reminded that Army units are in a transition from Series H to Series J, Tables of Organization and Equipment. By the time V(INT)^2 is fully fielded, the tables may have changed again. For this reason an effort has been made to tie the V(INT)^2 to a set of doctrinal principles and techniques rather than a fixed organizational structure. The focus of this document is a combined arms battalion with appropriate combat and combat service support elements, beginning with the battalion and ending with the armored fighting vehicle (AFV).

Specification of the doctrinal implications of V(INT)^2 for small armor units has resulted in a detailed breakdown of the functional and informational battlefield requirements tailored to each of the following echelons: battalion, company, platoon, and individual vehicle crew. The report documents how V(INT)^2 capabilities will be designed to meet each of these small unit's unique requirements for near real-time battlefield intelligence in relation to their doctrinally sanctioned roles. In addition as the capabilities of V(INT)^2 are formulated, its emergence as a force multiplier of nearly unprecedented magnitude is clearly outlined.

The revolutionary capabilities of V(INT)^2 may provide the foundation for fundamental changes in the military doctrine of armored combat. The analyses contained in this report suggest what the nature of these changes might be. Selected examples of these potential doctrinal transformations discussed include: the development of a generic data base that subsumes the sometime arbitrary distinctions made between offensive and defensive operations; the fusion of multi-modal sensor inputs into integrated and readily comprehensible intelligence summaries, the lethal leverage realized by secure, precise and instantaneous intelligence communications; the decisive quality of tactical decisions informed by military expert rule-based protocols; the integrity of military operations realized by V(INT)^2's forging of a true man/machine/mission (M^3) alliance.

This publication is not an implementing document. While closely following and expanding on the V(INT)^2 Organization and Operation Concept, it is not approved doctrine. It has, however, been reviewed and concurred with by principal agencies of the US Army Armor Center including: the Directorate of Combat Developments, Evaluation and Standardization, Training and Doctrine,

and the Department of Command and Staff. Comments from the reviewers for these agencies have been incorporated into this revision of an earlier working paper.

I OPERATIONAL CONCEPT

1. Purpose: This paper describes the operational concept for a Vehicle Integrated Intelligence ($V(INT)^2$ system, to include a general overview of its operation, capability, and use. It briefly describes the systematic structure of $V(INT)^2$ and provides the foundation for $V(INT)^2$ development. This concept statement is the user source document which should guide the maturation of $V(INT)^2$ concept and technology from the current state to the fielding of a battlefield system.

2. Definition: In this concept the acronym $V(INT)^2$ describes the total vehicle system that provides selected information to various levels of command and crew positions to improve the combat capability of a fighting system or a combat unit or both. $V(INT)^2$ is a command and control aid which is totally integrated into close combat vehicles to receive, assimilate, and process information, and then present that information in a logical sequence and manner, to assist the commander in fighting his vehicle or unit and in directing the battle. The $V(INT)^2$ architecture consists of sensors (both on board and external) to gather information, intelligent software to manage information, and an interface to convey information to and receive information from the human user. The delineation of where $V(INT)^2$ begins and other system architectures start is not precise, and may vary by application. $V(INT)^2$ is a customer of VISTA and in many cases will input to VISTA architecture. $V(INT)^2$ will use existing command, control, and communication (C^3) capabilities, may be part of the C^3 architecture in many cases, and will likely require

the development of new C^3 capabilities. The development of any and all $V(INT)^2$ capabilities must account for the totally integrated Army capability to support it. $V(INT)^2$ development should allow for growth to incorporate reasonable future technical capabilities, without wasting resources by designing equipment to use information that will never be available due to technical and/or monetary restraints.

3. Scope: Most manned weapons carriers of the future will have, in some degree, capabilities similar to $V(INT)^2$. Close combat forces will require a fairly extensive $V(INT)^2$ capability to deal with the manned and robotic armored formations which will be proliferated on the future battlefield. $V(INT)^2$ will assist the commander in leading the highly destructive force under his command, be it a close combat regiment or a single, close combat vehicle. This operational concept encompasses the use of $V(INT)^2$ in the close combat role, the family of vehicles, and the doctrine (AirLand Battle and AirLand Battle 2000) in being at the time $V(INT)^2$ is fielded.

4. Operational Concept:

a. General:

(1) The increasing sophistication of the battlefield will cause an enormous increase in the amount of information with which future commanders must deal. If he is to win the AirLand 2000 battle on a highly lethal and fluid battlefield, the close combat commander will require more and more real time intelligence and situational information

plus the ability to assimilate and use it quickly in order to make and execute decisions faster than the enemy can react to them or cope with them. There hinges the defeat mechanism and the success of the AirLand 2000 concept. The ability of the average, well-trained commander to deal with the plethora of battlefield information thrust upon him is severely overtaxed at present. Without assistance in the future, the commander will find that his inability to handle this huge volume of information will be an insurmountable obstacle to his success in the AirLand 2000 battle.

(2) In spite of an elaborate sensor suite and magnificent brain, the human being is not very good at multiple sensor fusion. Overloading one or more human senses tends to suppress conscious reception on other sensor channels. The inability of most people to read and comprehend a visual aid while simultaneously absorbing and understanding the words of a speaker is a simple example of sensor overload. This is multiplied several times over on the battlefield, especially the AirLand 2000 battlefield. On the other hand, humans are superb decision makers. Humans make decisions by instanteously subjecting their alternatives to the data base of past experience. Due to their speed of function, computers can receive multiple inputs with little difficulty. The $V(INT)^2$ capability envisioned in this concept will merge technology and human ability to produce a capability greater than either can achieve alone. $V(INT)^2$ will assist in decision making by

highlighting the information most pertinent to the situation at hand. In effect, the decisions made by V(INT)^2 regarding what information is most important will also be human decisions, in that they are imbedded in the expert system housed in V(INT)^2 software. In other words, V(INT)^2 will assess all information at hand against a set of decision rules that represents the collective best judgment of subject matter experts and then provide to the user that informtion judged most important on a priority basis. V(INT)^2 may suggest potential tactical decisions to the commander, but the ultimate decision would be the commander's. Leadership and command ability are not supplanted, but augmented. The commander can accept, reject, or modify these potential decisions, using his best judgment, taking whatever prudent risks he deems necessary. In short the commander can rapidly apply the principles of war--maneuver, surprise, unity of command, etc.--to fight and win the AirLand 2000 battle.

(3) V(INT)^2 is essentially an electronic information gathering, processing, and distribution system and falls under the Vetronics umbrella. It is the vehicle commander's primary interface with both his vehicle and his battle situation; and will be fully integrated into the vehicle's electronics structure. The brain of V(INT)^2, its artificial intelligence package, will be manipulated by the main vehicle processor and will therefore be directly linked to on-board sensors, control stations, and communications links. The V(INT)^2 hardware of any

fighting vehicle will be capable of accepting battle control hand-off from a command vehicle, when required by the tactical situation, perhaps to a lesser degree until upgraded. Where Vetronics builds system redundancy and survivability into the individual vehicle, this $V(INT)^2$ capability does the same for the entire combat unit.

(4) Some level of $V(INT)^2$ capability will be provided to each vehicle of the heavy fighting force depending on that vehicle's relationship in the command structure and its particular mission. The $V(INT)^2$ subsystems and components will be modular and capable of accepting software to the extent required for mission tailoring. $V(INT)^2$ systems will be designed to preclude a vehicle's visual or electronic signatures from giving a unique, identifiable battlefield appearance, as required by the concept of a modular, indistinquishable family of Future Close Combat Vehicles (FCCV).

b. Use: $V(INT)^2$ will be used by vehicle commanders and unit commanders to receive (near) real-time information and intelligence in a responsive, timely and pertinent manner and to assist them in making rapid, well-founded battlefield decisions. Vehicle commanders will take the most appropriate actions (e.g., seek cover, take evasive action, maneuver, fire weapons, etc.) to properly fight their vehicles. Unit commanders will both fight their own vehicles and will use $V(INT)^2$ and it's external communications channels to issue orders and fight their units in the overall battle.

(1) Information:

(a) The information and intelligence provided to the vehicle commander and crew by V(INT)^2 allows them to see the battlefield to the depth required. Vehicle commanders can utilize their V(INT)^2 systems according to unit SOP or orders so that the types of information most pertinent to the given tactical situation and to the particular operation being conducted will be provided. For example, offensive operations may call for more detailed operations graphics and map reconnaissance capabilities while defense operations may require sectors of fire and intervisability diagrams. V(INT)^2 will allow the vehicle commander to select the types of information most pertinent to his current situation. Continuous, periodic, and on-call information will be provided. Appendix I lists information suggested for display.

(b) Information and intelligence which is provided to the vehicle commander and crew will come from a variety of sources. Data from on-board as well as external sources will be communicated to the V(INT)^2 system, processed by the main vehicle processor and distibuted by intravehicle communication links. On-board information will consist of information preprogammed into the V(INT)^2 memory, communicated from vehicular regulating, operating, and intelligence sensors, and command inputs from the crew stations. External information will be received by the vehicle from other sources such as robotic or remotely controlled sensor platforms, reconnaissance units, CI systems like VISTA, admin-log

communication nets, and command inputs. All information will be continuously assimilated and processed by the V(INT)2 AI software, then provided to the commander or appropriate crew member in a timely manner and in a priority sequence.

(c) Communications links between external sources and between V(INT)2 systems will use secure, highly efficient transmission modes such as burst transmission, spread spectrum or frequency hopping to reduce emissions, insure message accuracy, and reduce enemy countermeasures. Transmissions will be encoded so that information will be accepted or discarded according to programmed V(INT)2 instructions and alleviate individual V(INT)2 system processor workloads.

(2) Command and Control: The man-machine interface of the V(INT)2 system will maximize the user's capability to fight his vehicle's or his unit's battle. Commands can be given through V(INT)2 to other crew members, or to other vehicle V(INT)2 systems as well as to robotic or remotely controlled systems and sensors. The V(INT)2 system will complement voice communications. Crew positions other than the commander may be provided with V(INT)2 stations that receive some information and have some command and control capability. The commander's station would exercise the most control and have access to all information, but redundancy is built into V(INT)2 by giving other V(INT)2 stations the ability to accept control, perhaps to a lesser degree, from the comand station when needed.

(3) Training: $V(INT)^2$ represents a powerful capability which will not go wasted in the training environment. Because of its excellent imbedded training capability $V(INT)^2$ can train the user of the $V(INT)^2$ system independently of any other training device. $V(INT)^2$ may also be used to train combat crews and units through battlefield simulation. Entire units could undergo training or operational testing by conducting field training exercises or command post exercises through netted $V(INT)^2$ systems. The exercise controller or tester could introduce and evaluate unit response to various scenarios and situations through a master control station in the netted system.

5. Summary: A $V(INT)^2$ system with capabilities as outlined in this paper will give the close combat commander the advantages he needs in seeing, fighting, and training for the battlefield - a battlefield in which he must fight outnumbered and win. $V(INT)^2$ will reduce the overburdening tasks now required of the commander. It will ease his C^3 problems and will make him a more effective fighter and leader.

CANDIDATE INFO FOR DISPLAY

Appendix I

1. Not all information need be displayed to the vehicle commander. Effectiveness may be enhanced if selected information is displayed only to other crew members. Information should be provided either continuously, as it occurs, when it becomes important, or on call.

2. Possible information for display to the vehicle commander follows:

a. Continuous information:

(1) Terrain map.

(2) Selected operations graphics.

(3) Friendly unit's/vehicle's locations.

(4) Enemy unit's/vehicle's locations.

(5) Obstacles; e.g., minefields, tank ditches.

(6) Contaminated areas.

b. Real time information (display must not interfere with the commander's immediate actions):

(1) Orders/reports from higher/lower.

(2) Artillery fire.

(3) Battlefield Identification, Friend or Foe (BIFF).

(4) Close Air Support (CAS) strikes.

(5) Friendly destroyed/damaged.

(6) Enemy destroyed/damaged.

(7) Warnings of vehicular engagement or designation.

(8) Warning of aircraft entering area.

(9) Vehicle Built in Test Equipment (BITE) reports.

c. On-call information (must be assimiliated and stored until needed by the commander):

(1) Tactical data:

(a) New map sheets.

(b) Operations graphics (detailed).

(c) Intervisibility diagrams.

(d) Availability of fire support.

(e) Availability of CAS/attack helicopters.

(f) Enemy intelligence update.

(g) OPLAN.

(2) Fire control data:

(a) Weapons available (unit/vehicle).

(b) Sectors of fire.

(c) Target location.

(d) Target range.

(e) Target hand-off.

(f) Target priority.

(3) Logistics data - capable of indicating unit or vehicular status:

(a) Class I.

(b) Class III.

(c) Class V.

(4) Maintenance data:

(a) Scheduled services.

(b) Tube life, service.

(c) Synchronization/alignment.

(d) BITE.

4. Administrative data: personnel status.

II BATTALION

The battalion is the lowest level at which a completely self-contained organization exists. It is at the battalion where all combat, combat support, and service support elements are coordinated to fight the battle and sustain the force.

1. Command and Control

1.1 Generic Plans and Operations

1.1.1 Maneuver Concepts

Prior to any discussion of more specific plans and operations, it is important to note that for all the differences usually associated with various tactical missions they are, in reality, highly similar. The planning and the execution of both offensive and defensive maneuvers are developed from the same critical informational features, the same generic data base (i.e., METT-T). The following parallels between offensive and defensive maneuver tactics extends this notion of generic considerations even to the level of particular missions:

Comparable Maneuver/Tactics

Type of Offensive Maneuvers	Comparable Defense
Frontal Attack	"Static" Defense (linear)
Flank Attack	"Dynamic" Defense
Penetration	Strong Point
Movement to Contact	Retrograde
Counterattack	Ambush

This concept can be further developed using an illustration of the counterattack and the ambush (Figure 2-1).

Characteristics

Counterattack	Ambush
1. Fix enemy at or guide enemy into a favorable location (e.g., deception, mines, deliberate munitions).	1. Await or guide enemy into a favorable location.
2. Maneuver to attack flank or move to attack flank by fire.	2. Attack flanks with fires or fire and maneuver.

Similarities include:

1. Surprise attack.
2. Originated from concealed location.
3. Oriented on flanks.
4. Using fires or fire and maneuver based on comparative strengths.

Figure 2-1. Comparison of Offense and Defense

It is important also to note that a defensive operation at division level might be an attack for one or more subordinate battalions (either as an ambush or as a spoiling attack). Likewise, an offensive deliberate

attack may leave a subordinate element defending as an economy of force. The importance of this concept to V(INT)2 is that the amount of data storage necessary to support generic planning is significantly smaller than that programming necessary to support different processes for each type of operation.

1.1.2 Planning. The six step planning process in Tables I-VI shows the relationship between offensive and defensive planning and how the V(INT)2 supports them.

TABLE I

STEP 1 - ANALYZE THE AVENUES OF APPROACH

Offense	Defense	V(INT)[2]
1. Locate objectives and routes to those objectives.	1. Locate enemy avenues for company-sized elements.	1. Locates avenues of approach.
2. Determine key/dominant terrain and choke points which affect movement on those avenues.	2. Analyze key/dominant terrain and choke points which hinder movement on those avenues.	2. Selects key/dominant terrain in area of analysis.
3. Identify objectives which support main effort.	3. Identify avenues which will support an enemy main effort.	3. Determines what size/type element an avenue will support.
4. Avenues are analyzed in terms of: Maneuver Space Trafficability Obstacles Cover and Concealment Observations and Fields of Fire Key/Dominant Terrain Does it Avoid Enemy Strength? Does it Permit Attack on Rear or Flanks?	4. Avenues are analyzed in terms of: Maneuver Space Trafficability Obstacles Cover and Concealment Obscuration and Fields of Fire Key/Dominant Terrain Does it Support Enemy Strength? Does it Permit Attack on Flanks or Rear?	4. Analyzes avenues in terms of: Maneuver Space Trafficability Obstacles Cover and Concealment Obscuration/Fields of Fire Key/Dominant Terrain Does it Support An Attack? Does it Support Maneuver to Attack Flanks of a Moving Force?

TABLE II

STEP 2 - SELECT TENTATIVE POSITIONS

Offense	Defense	V(INT)[2]
1. Select enemy positions: a. Size. b. Location. c. Capability.	1. Select friendly positions: a. Size. b. Location. c. Capabilities.	1. Select likely positions: a. Size. b. Location. c. Type force composition.
2. Determine suppression requirements.	2. Plan for suppression/limited visibility countermeasures.	2. Determines suppression requirements at designated locations.
3. Identify (or create) weak points.	3. Develop mutual support to overcome weaknesses.	3. Identifies "dead space."
4. Place platoons on avenues of approach.	4. Place platoons to cover avenues of approach.	4. Selects likely positions.
5. Focus first on the AA supporting the main effort.	5. Focus first on AA supporting the main attack.	5. Selects likely main effort.
6. Determine actions if enemy is encountered at various points on the avenue.	6. Determine probable enemy actions at various points on the avenue of approach.	6. Presents most likely approaches to an objective.
7. Determine the type of platoon each avenue will support.	7. Determine the type of platoon the area or position will support.	7. Prioritizes positions by weapons types.
8. Identify danger areas and actions to be accomplished in those areas.	8. Identify danger avenues of approach and required actions on those avenues.	8. Highlights critical areas (as defined by programmer).

TABLE III

STEP 3 - ALLOCATE SPACE AND TASK ORGANIZE

Offense	Defense	V(INT)[2]
1. Group tentative platoons positions (on each AA) by type.	1. Group tentative platoons (in each area or position) by type.	1. Groups elements into tentative platoon/ company-sized elements.
2. Assign area based on the type of platoons needed to negotiate the avenue and assault the objective.	2. Assign space based on the number and type of platoons needed to complete the mission.	2. Indicates "type" platoons by mission requirement.
3. Position a HQ to control a designated area on the AA.	3. Position a HQ to control a designated defensive area.	3. Indicates HQ elements.
4. Identify and weigh the main effort, providing the main attack with:	4. Identify and weigh the main effort, providing the main effort with:	4. Selects most likely main efforts. Identifying needs of mission against known assets and current missions:
a. Tanks. b. Attack Helicopters. c. Priority of Fires. d. CAS Missions. e. Additional Platoons. f. Engineer Support. g. Airlift or Other Mobility Assets. h. Air Defense. i. The AA Which Best Supports the Mission. j. Reserve Positioned to Support Operation. k. Positioning of Security Elements.	a. Tanks. b. Attack Helicopters. c. Priority of Fires. d. CAS Missions. e. Additional Platoons. f. Engineer Support. g. Airlift or Other Mobility Assets. h. Air Defense. i. The Defensive Area Which Best Supports the Mission. j. Reserve Positioned to Support Operation. k. Positioning of Security Elements.	a. Tanks. b. Attack Helicopters. c. Priority of Fires. d. CAS Missions. e. Additional Platoons. f. Engineer Support. g. Airlift or Other Mobility Assets. h. Air Defense. i. Areas Which Support Action. j. Best Locations for Reserve Forces. k. Positioning of Security Elements.

STEP 3 - ALLOCATE SPACE AND TASK ORGANIZE (cont)

Offense	Defense	V(INT)[2]
5. Choose control measures to support maneuver.	5. Choose control measures to support maneuver.	5. Ensures timely, standardized, and precise control measures across the entire organization.
a. Routes. b. Attack Positions. c. Line of Departure. d. Zone/Axis/Direction of Attack and Limited Advance. e. Phase Lines. f. Fire Coordination Lines. g. Check Points. h. Pyrotechnics. i. Movement Techniques.	a. Routes. b. Wide Positions. c. FEBA/FLOT. d. Sector/Battle Position/ Strong Point. e. Phase Lines. f. Fire Coordination Lines. g. Check Points. h. Pyrotechnics. i. Movement Techniques.	

TABLE IV

STEP 4 - INTEGRATE FIRES AND OBSTACLES

Offense	Defense	V(INT)[2]
1. Designate Direct Fire Control Measures.	1. Designate Direct Fire Control Measures.	1. Designates/Records Indirect Fire Control Plans.
2. Incorporate Indirect Fires and CAS.	2. Integrate Indirect Fires and CAS.	2. Coordinates FSO and ALO information with Overall Plans.
3. Identify Likely Area Where Obstacles Will Need to be Breeched and Integrate Suppressive Fires.	3. Identify Locations for Obstacles and Integrate With Direct Fires.	3. Identifies Areas for Barriers/Obstacles.
4. Assign Responsibility for Critical/Danger Areas.	4. Assign Responsibility for Dangerous Avenues (Control Effort).	4. Records and Transmits Responsibilities to Subordinate Elements.

TABLE V

STEP 5 - PLAN LOGISTICAL SUPPORT

Offense	Defense	V(INT)^2
1. Communications.	1. Communications.	1. Burst Transmissions.
2. Resupply.	2. Prestocking/Resupply.	2. Records Locations and Types of Supplies Available.
3. Medical Evacuation.	3 Medical Evacuation.	3. Links Medical Support Directly to Using Elements Through Medic V(INT)^2.
4. Mess.	4. Mess.	4. Locates and Transmits Data on Class I.
5. NBC Defense.	5. NBC Defense.	5. Automatic Transmission of NBC Alerts and Reports.
6. POW.	6. POW.	6. Locates and Charts Routes For Speedy Evacuation. Alerts Rear Elements.
7. Personnel.	7. Personnel.	7. Maintains Data Base and Manning Levels for Replacement/Casuality Systems.

TABLE VI

STEP 6 - RECORD AND TRANSMIT THE PLAN

Offense	Defense	V(INT)2
1. Prepare Plan.	1. Prepare Plan.	1. Transmission of Mission in Fixed Formats.
2. Prepare Overlay.	2. Prepare Overlay.	2. Transmission of Data.
3. Issue FRAGO.	3. Issue FRAGO.	3. Burst Data to Subordinate Elements.
4. Supervise.	4. Supervise.	4. Monitors All Sensors.

1.2 Organization and Facilities. The battalion C^3I organization consists of the command group, command post, and trains.

1.2.1 Command Group. Each commander tailors his command group based on an assessment of his subordinates and the situation at hand. For example, one commander may have his executive officer forward while another may choose to have his S3 perform that mission. Regardless of who is selected, the command group has three combat vehicles (two Armored Fighting Vehicles (AFVs) and the tactical air control party's AFV) which may be employed together or at two separate critical points on the battlefield. The $V(INT)^2$ command group vehicles are capable of dual mode operation in that they are linked to the staff $V(INT)^2$ while retaining the capability to see the immediate battlefield as a track commander (see Chapter V). This dual capability means that the vehicle can link directly to the brigade command net and subordinate command nets for common transmissions and has the capability to call up and see the battalion's tactical and logistical situation as well. While the command group may call up a broad range of information, it is primarily a fighting organization and the commander positions this group where it can be most responsive to the tactical needs of the units. The following types of information are displayed on the commander's $V(INT)^2$:

Continuous Information

Small Scale Maps (Approximately 6 Km^2)

Friendly/Enemy Locations

Current Operations Map

Air/Artillery Targets

Barriers and Obstacles

Alerts to Changing Enemy Situation

On Call

Battalion Situation Map (Large-Scale Map)

Logistical Status (Incl Equip)

Personnel Status

Combat Support Status

Special Information

Demand Input (from Bde)

Brigade Situation Map

Mission Changes

The ALO vehicle controls tactical air assets and provides the link to establish IFF for friendly air strikes.

1.2.2 Command Post. The CP is the tactical control element of the battalion. The CP consists of the Tactical Operations Center (TOC) and the facilities which support it. It is in the TOC that the primary $V(INT)^2$ data base is located. The TOC is normally staffed by the S2 section, S3 section, Fire Support Element, and occasionally by the Air Liaison Officer. The staff officers for those sections may operate at the TOC or forward dependent on the commander's directives. The $V(INT)^2$ functions in these areas are critical and need to be discussed in detail.

1.2.2.1 S2. The battalion S2 develops the intelligence preparation of the battlefield. He receives his guidance from the battalion commander and the operations order from the next higher headquarters. The commander outlines his intention or guidance in terms of the battalion's areas of interest and influence.

In an area of influence, commanders locate and monitor the progress of those enemy formations that can affect their current operations, fighting them when necessary with organic and/or supporting means. The actual area of concern will vary in size with the nature of the terrain, the mobility and dispositions of the enemy, and the capability of the friendly unit to react to enemy actions. Commanders monitor enemy forces beyond the FLOT or attack objectives according to the criteria below.

Areas of interest extend beyond areas of influence. They include adjacent territory occupied by enemy forces capable of affecting a commander's operations in the near future. Commanders' guidelines for these limits appear below. Each echelon of command receives information about enemy forces in its areas of interest primarily from higher and adjacent commands. This information may also come from tactical units, other services, allies, or national agencies. It is provided to operating units through the all-source intelligence center (ASIC) system.

For example, the S2 may receive the following guidance. "I'm concerned about a second echelon force counterattacking our flank. So I want to know immediately if any battalion-size armored force moves into our area of interest. I also want to avoid any major ambushes during this attack so I want all obstacles and covered/concealed areas identified early." The S2 uses his knowledge of combat requirements and the guidance he has received to program the S2 $V(INT)^2$ console to provide the command and control element with the

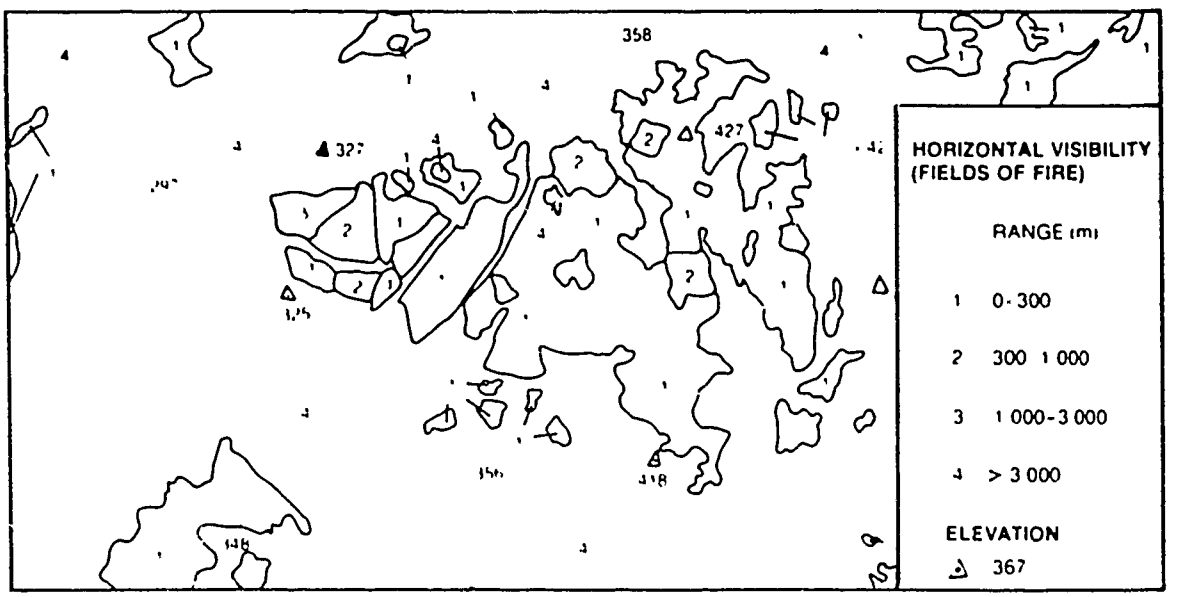
Table VII. Areas of Influence and Interest

Areas of Influence		Areas of Interest	
Level of Command	Time Beyond FLOT or Attack Objectives	Level of Command	Time Beyond FLOT or Attack Objectives
Battalion	up to 3 hours	Battalion	up to 12 hours
Brigade	up to 12 hours	Brigade	up to 24 hours
Division	up to 24 hours	Division	up to 72 hours
Corps	up to 72 hours	Corps	up to 96 hours
Echelons above Corps (EAC)	up to 96 hours	EAC	beyond 96 hours

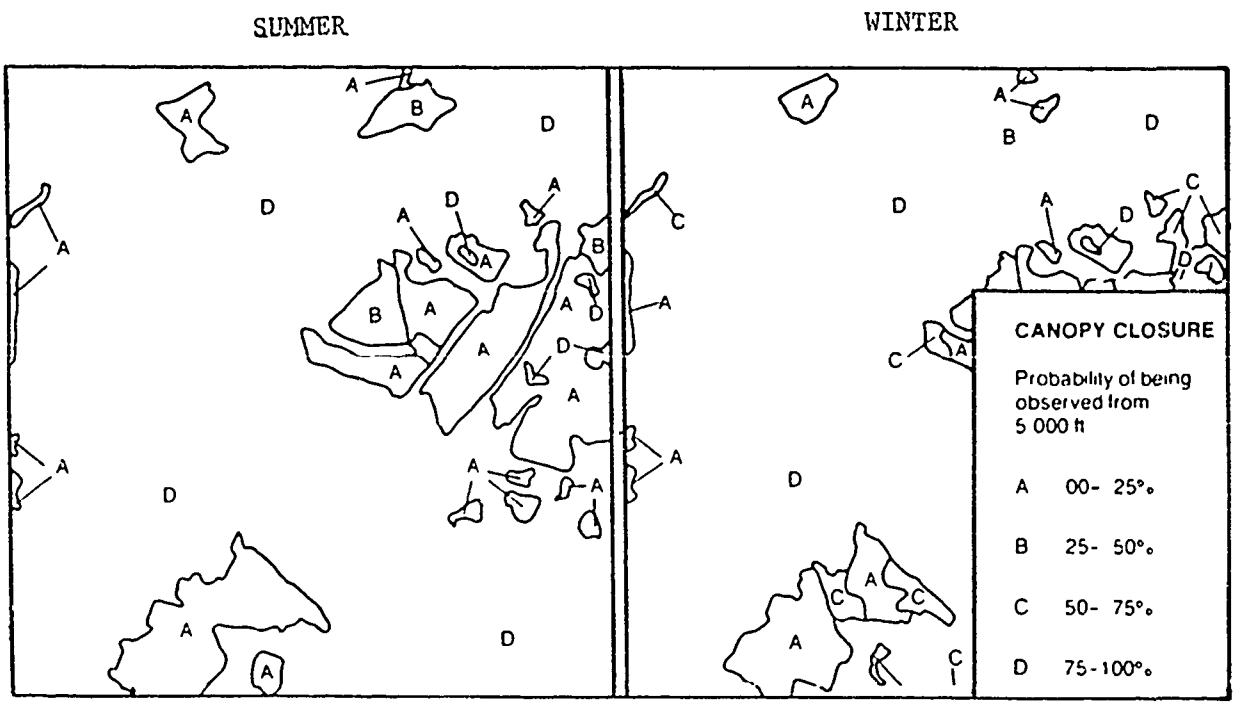
appropriate combat information. The S2 calls up planning data concerning the area of operations and integrates this data with enemy dispositions.

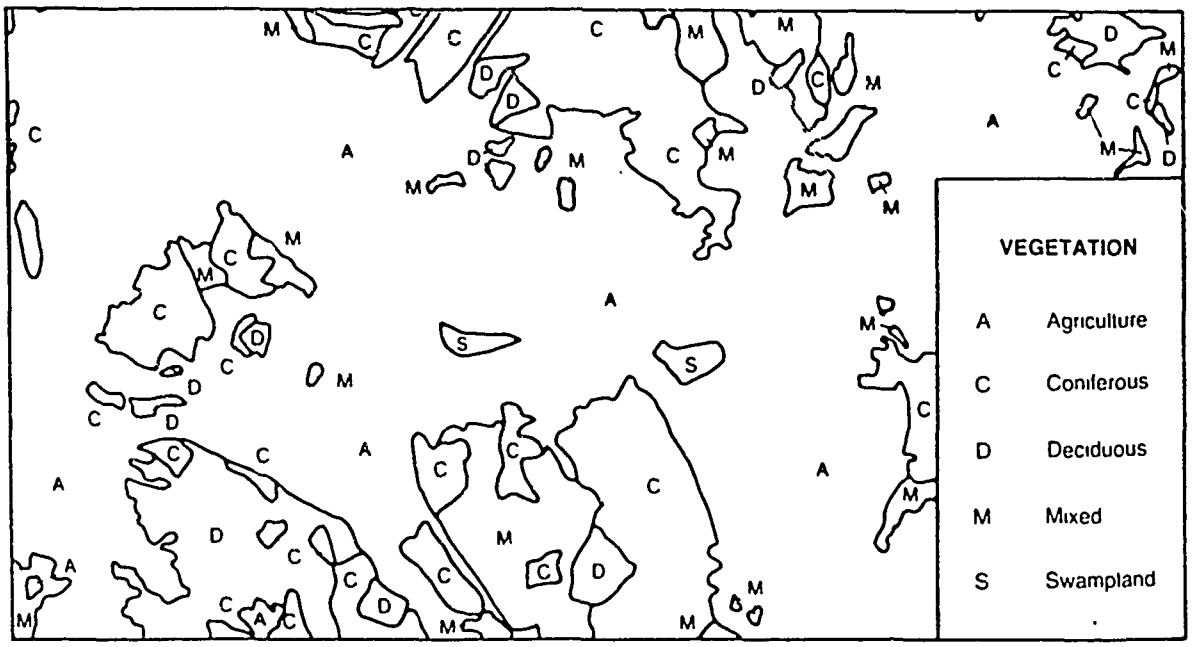
It should be kept in mind that information displays generated by V(INT)[2] for higher echelon personnel such as the S2 will employ much more complex formats than those prepared for lower echelon units/personnel. Formats must be tailored to match the complexity of the information required and the expertise of the intended recipient. Examples of the "type" of displays required by the S2 for planning selected operations are provided on the following pages.

*Identify observation and fields of fire.

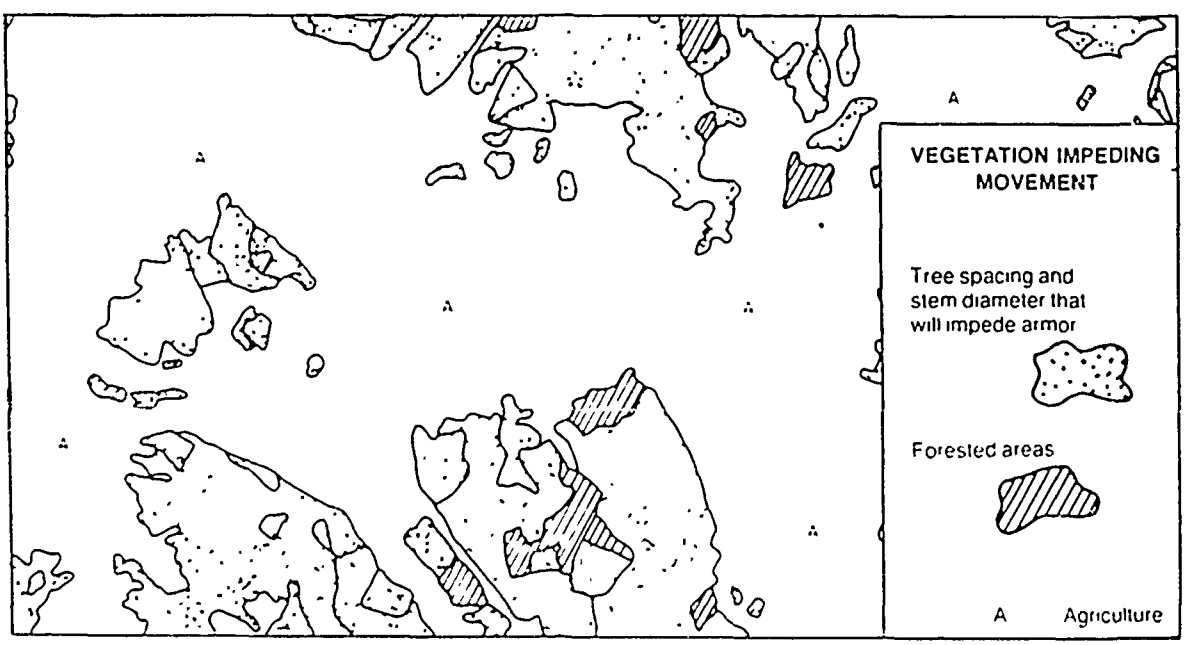


*Identify cover and concealment.



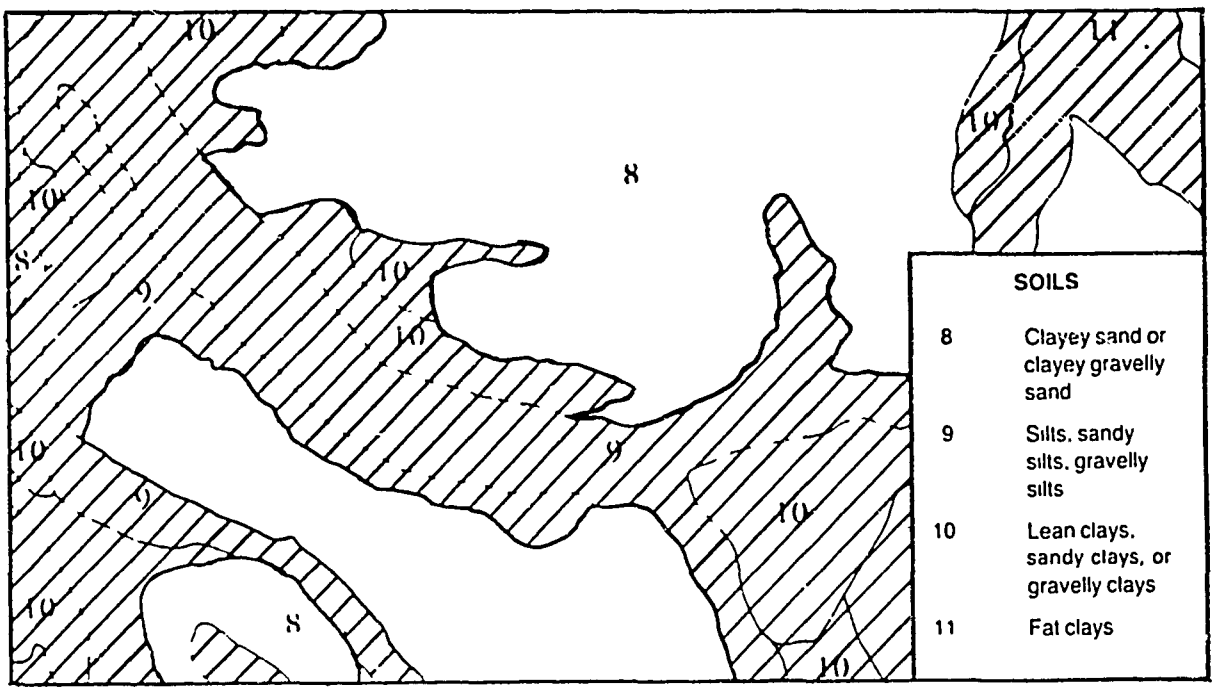


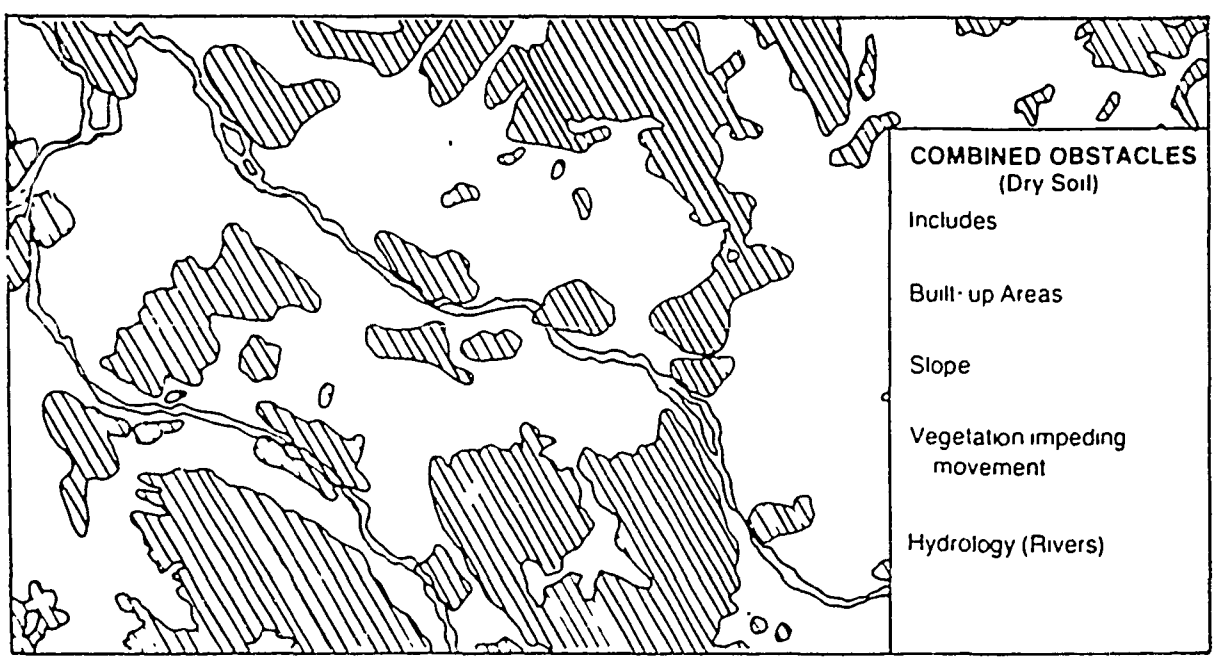
Vegetation patterns shown in this figure may favor certain avenues of approach (A/A) because of concealment available for movement.

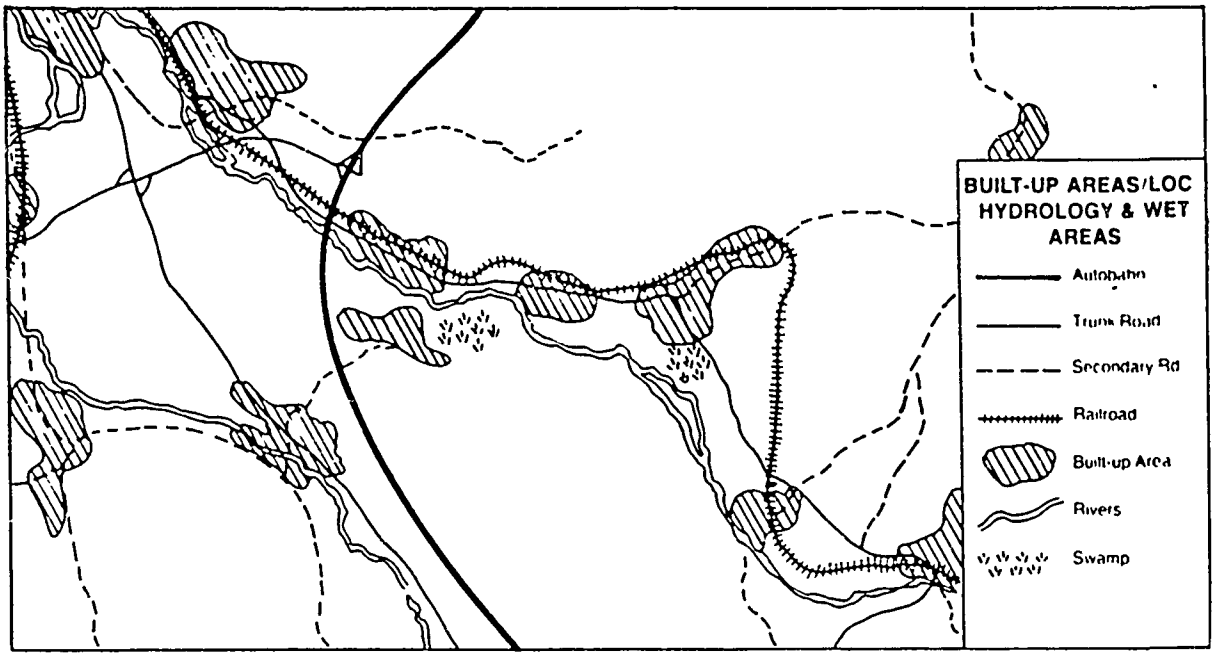


The vegetation impeding movement assists in determining areas of trafficability. This should not imply that movement through these areas would be totally impossible, but rather than minimum doctrinal rates of speed could not be met if movement were attempted through these areas.

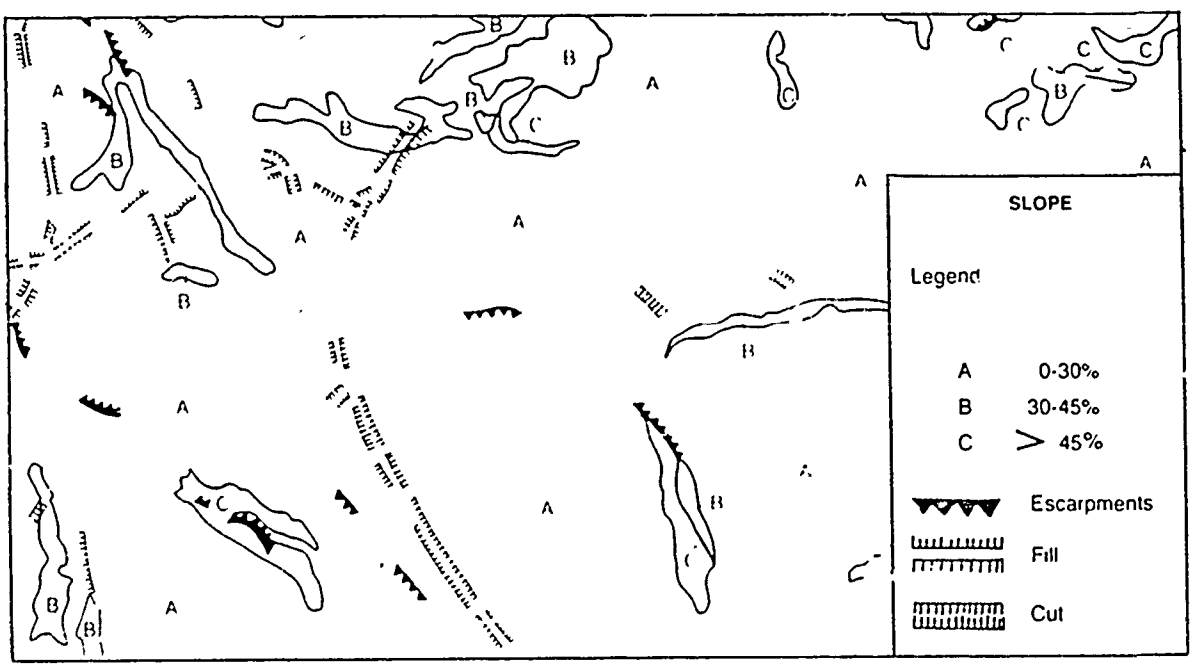
*Determine trafficability.





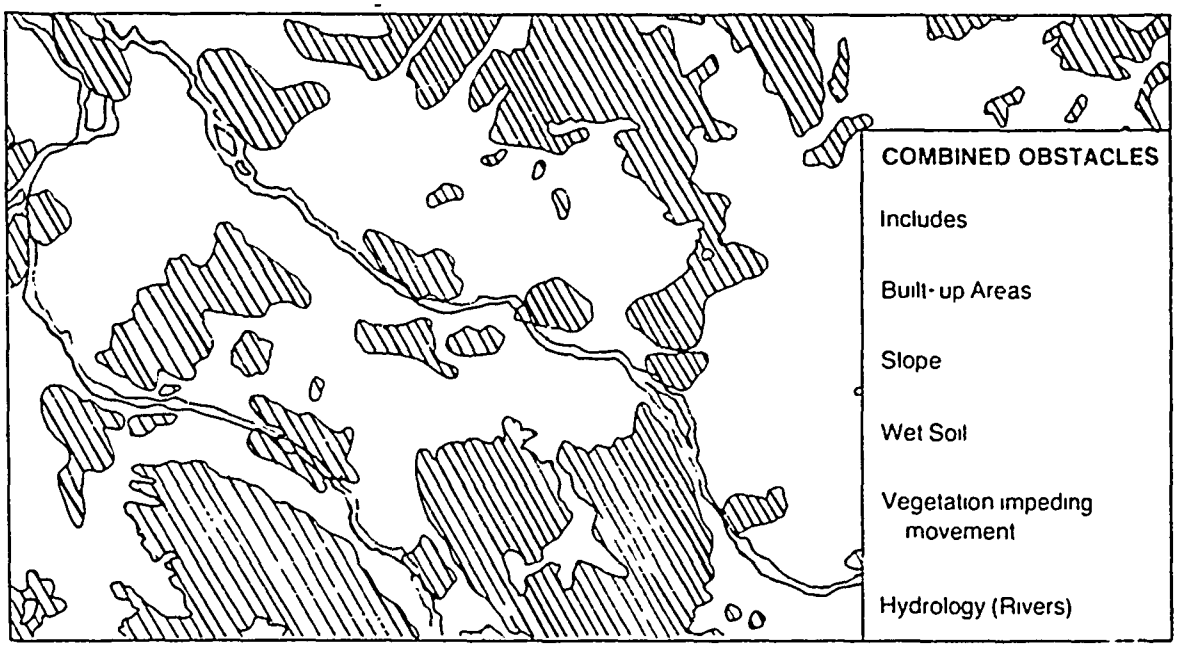


This is an overlay depicting built-up areas, lines of communication, and wet areas. They assist the S2 in identifying avenues of approach and main supply routes (MSR).

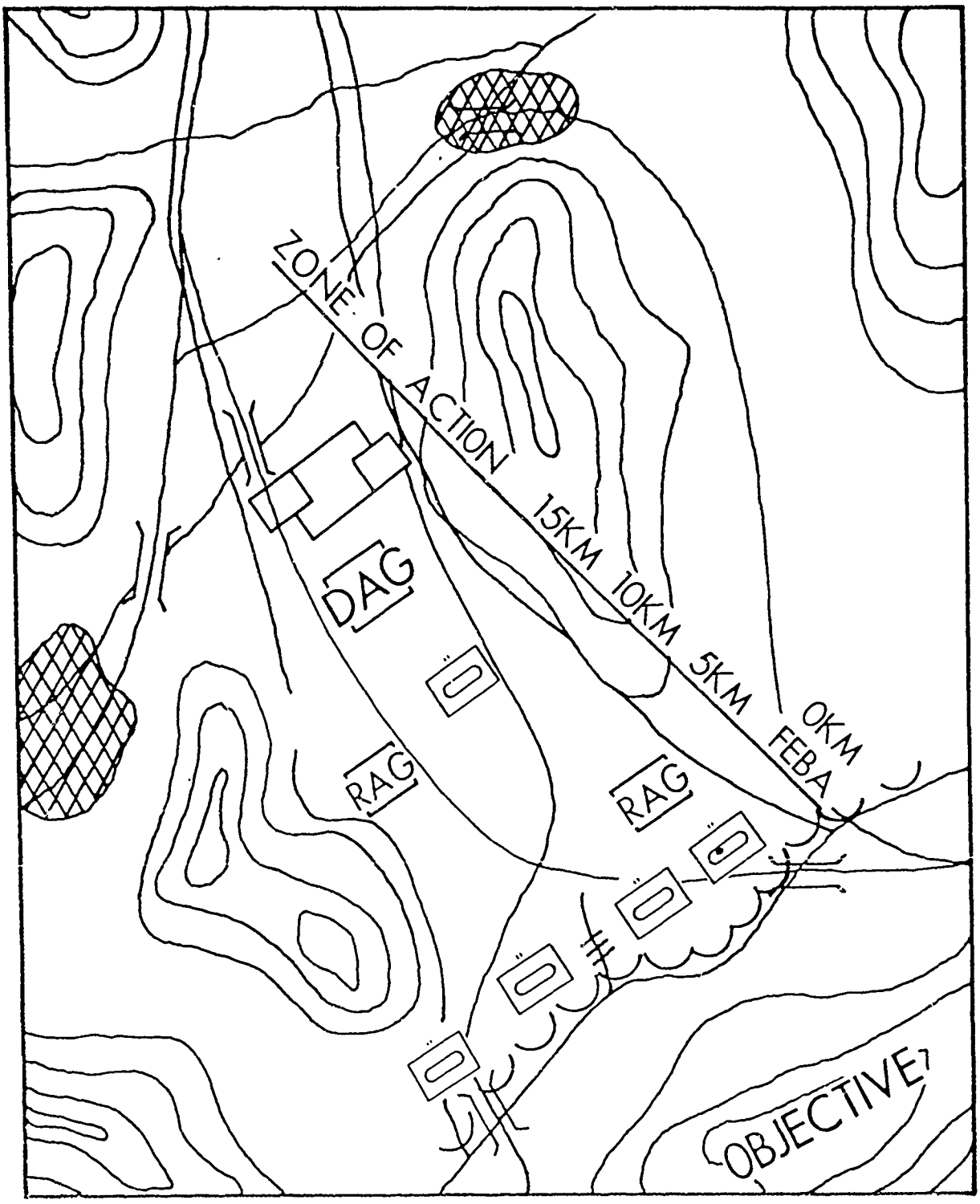


When the overlay depicting slope is added, the S2 should be able to disregard some likely avenues of approach as not trafficable.

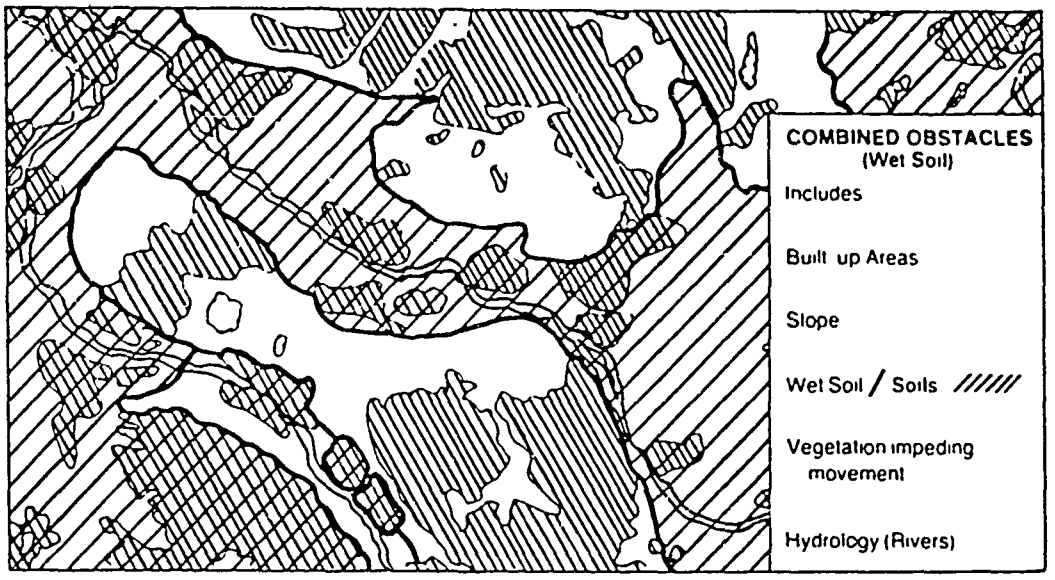
Combined Overlays.



*Position of enemy forces on the ground.



While each of the separate displays may be used for the S2's planning process, the display which might be transmitted to the commanders would look more like the following overlay with danger areas highlighted.



The overlay is particularly important because it integrates all obstacles into one display. This greatly simplifies further analysis of avenues of approach and mobility corridors. All obstacles are cross-hatched and the blank areas are those where all forces can move.

Once the planning data is complete the S2 programs or "requests" that the $V(INT)^2$ alert the battalion when sensors detect essential elements of information (in this case, data about a tank battalion moving in the area

of interest). The S2 continues to process data as it becomes available, overriding the automatic information flow when needed to provide critical information such as an air mobile operation to the battalion's rear. During the battle the S2 monitors displays of enemy forces and analyzes the data for size, activity, and intentions. He then simplifies data to transmit to the command group; e.g., while the S2 may observe a series of vehicles in clusters, he transmits platoon, company, and battalion symbols when possible to the smaller command group's displays.

1.2.2.2 The S3.

The S3 uses his V(INT)^2 to generate alternate courses of action. He accomplishes this task using the capability of the V(INT)^2 to generate and provide hard copy print of each course of action. The V(INT)^2 can be programmed to provide a best course of action or the best courses of action (number dependent on time available). It allows the S3 and commander to analyze these courses and modify them to meet the commander's need. The V(INT)^2 does not make decisions but provides alternatives which can be used, modified, or rejected by the commander. An example of the type information a commander uses would be to develop an alternate course of action to execute if the enemy achieves local air superiority. Once these plans are developed, they are stored as contingency plans in the V(INT)^2 until conditions necessitating their use occur. When activated they are modified as necessary and immediately transmitted to subordinate elements. The command post data base is shared and

is the largest data base in the battalion's forward combat area. It is used by both the commander and the S3 when the command group is co-located with the command post.

When the command group is forward the V(INT)^2 automatically downscales its displays to the immediacy of the fight. The S3 section continues to monitor the overall battle and periodically updates the command group of actions which the commander may need to continue the battle; e.g., the movement of a counterattack force toward his flank. The S3 section also serves as the primary link with higher headquarters and serves as an alternate location for S1/4 planning during displacement of the trains or in lieu of a trains location lost due to enemy action.

The types of graphics which are employed by the S3 are drawn from a menu of graphics that are the "accepted" graphics of the time the system is fielded. The use of the V(INT)^2 is best illustrated through the use of a scenario which depicts the flow of a battle. The division alerts the brigade of an upcoming operation.

* The brigade alerts the battalion.

* The battalion receives the alert.

* The V(INT)^2 data base for the area of operation, current status, and plans for type missions is recalled.

* The brigade transmits an order to execute an Oplan in the battalion's data base. The Oplan is transposed on the V(INT)^2 with 82 analysis of area and enemy. Simultaneously, a Warning Order is transmitted to subordinate units alerting them as to the mission, time, and other relevant data.

* The staff (S1-4) coordinates information using V(INT)^2 assets.
* Estimates are presented to the commander.
* The commander makes his decision.
* Based on the commander's guidance, the staff completes the plan which is transmitted immediately to each subordinate commander. This information is limited to the battalion plan as "on call" data at the company level. The company commander's plan, as well as local enemy information, is displayed as continuous information while being stored at the battalion as "on call" information.
* During the operation, the S3 tracks the flow of battle. Those items of command interest are highlighted and stored for the battalion commander who can call for this information at any time. Control limitations are discussed in paragraph 2.

*The Bn S2 and S3 conduct their planning.

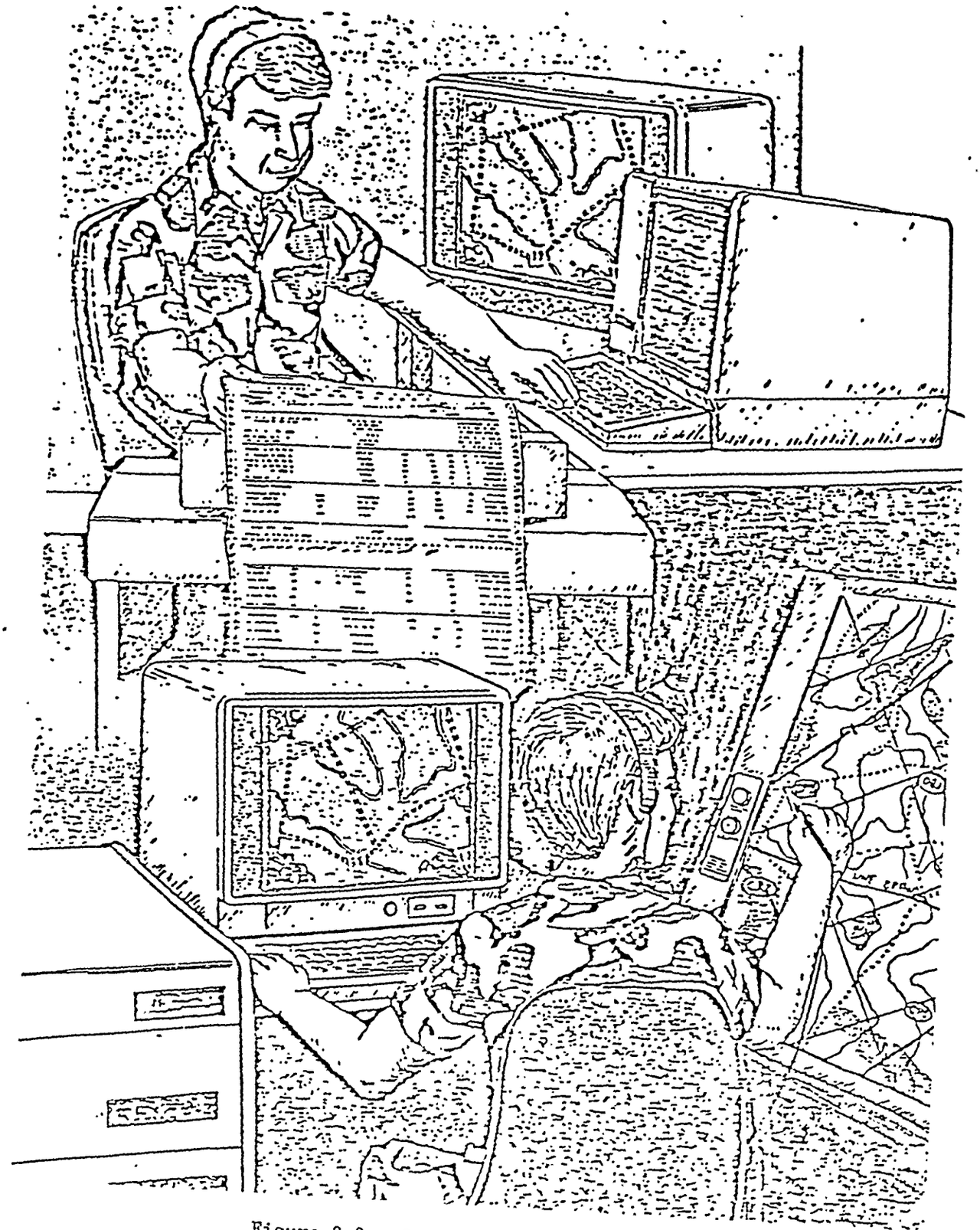


Figure 2.2. Command Post Planning

1.2.2.3 Other Activities. Several elements of the battalion operate under the staff supervision of the command post. These elements may operate under direct control of the command group or the command post.

1.2.2.3.1 Scout Platoon. The scout platoon is the primary reconnaissance and security element of the battalion. Using its V(INT)^2 it is the commander's means of extending his ability to maintain contact with the enemy or widely dispersed friendly forces.

Often gaps in information will exist due to the failure of external sensors. This failure may be due to natural phenomenon, mechanical failure, or enemy countermeasures. The scouts place their on-board sensors in those dead spaces. The same concept applies to retransmission in extended operations. The range and varied missions of the scout platoon has both large and small scale map capability with the capability to interface with any V(INT)^2 within 6 kilometers of its position. The scout vehicle will be equipped with sufficient sensors to conduct:

* NBC reconnaissance.
* Elementary soil and trafficability information (composition, slope, water currents).
* Extended target acquisition.
* Off-net communication with elements external to the battalion.
* Position locating and navigation.

* Identification of friend and foe.

* Automatic retransmission of data to battalion elements.

1.2.2.3.2 FSO/Mortar Platoon. The fire control net of the battalion includes all elements of the battalion. The combat vehicles V(INT)^2 function as the observer's digital message devices transmitting call for fire data. This data is monitored by the FSO at the command post. He can override the automatic fire control system as necessary but the call for fire and the decision logic (mortars vs. artillery) is primarily automatic. Efficiency in adjustment of fire is signifcantly enhanced by the position information accuracy provided by V(INT)^2. (See Crew Section 5.1.3.3) The FIST and Mortar Platoon V(INT)^2 are similar in characteristics and net with the DIVARTY firing battalions.

1.2.2.3.3 Engineers. The engineer unit is not an element of the battalion until it is tasked organized from the Division/Brigade. The engineer V(INT)^2 is used primarily as a position locator, navigating and recording (obstacles, etc.) device. The value of the device to this limited asset is that the engineers can be moved to areas where they are needed quickly. They can complete and record their effort (minefield, ford site improvement, lane clearing). Their V(INT)^2 then transmits the data to units in the area of the action by visual display.

1.2.2.3.4 Signal Platoon. The signal platoon (maintenance not included) provides the link with higher and lower headquarters. Long range relay is the most important capability of this element. Its

equipment consists of traditional radio communications, wire, and radio-wire integration (RWI) modules for V(INT)2. The RWI permits forward elements to operate a wire net in radio silence providing adequate information to generate V(INT)2 information for higher headquarters. During these periods the platoons and companies will be in listening silence receiving data but transmitting only on wire. The signal platoon equipment is directional and is set up in terrain masked positions when possible to increase the operational security of the battalion.

1.2.3 Trains.

The trains is an alternate command post for the battalion and duplicates the function of the S2/S3 when required. It's primary function, however, is to plan and coordinate the battalion's maintenance and support. This support is divided into two functional areas, personnel and logistics.

1.2.3.1 S1/Personnel.

1.2.3.1.1 Maintenance of Unit Strength. The S1 maintains the unit by anticipating effects of casualties and adjustments to the replacement system to get the right MOS to the right position at the right time to influence the battle. The S1 combines the S3's priorities for replacements with casualty information. He maintains a continuous loss estimate which is balanced against known replacements. V(INT)2 data coupled with other data is used to establish requisitions from the battalion through the DISCOM AG.

The S1 and S4 work closely to coordinate weapon system and personnel replacement. This includes:

* Building crews or partial crews.
* Manning replacement vehicles.
* Feeding, clothing, equipping, and transporting replacements.
* Coordinating link up between replacements and units.

1.2.3.1.2 Coordination with special units. The S1 has staff control over specific functional areas. This means that the S1 will have direct information from those sources even if those sources are not under his direct control. The first of these is the Military Police. Data which the S1 will receive from the Military Police include:

* Straggler control information.
* Movement control information.
* POW collection points.
* Other matters related to discipline, etc.

The second unit with a direct interface to the S1 is the Battalion Medical Platoon. While part of the battalion organization the Medical Platoon has a direct link to the medical assets of the next higher command for medical, medical supply, and evacuation support. It also has the V(INT)^2 capability of large and small scale map, local friendly and enemy forces, and other navigational information. Operations data other than immediate friendly/enemy situation is not included in the medical V(INT)^2. An example of the general function of a Medical Platoon V(INT)^2

is as follows: a forward deployed tank crew loses its tank commander to small arms fire. Data from the crew indicates injury to the TC. The location of the casualty and a route to that position is displayed on the medic's V(INT)2. When the medic arrives at the casualty's location, the TC is classified as critical which keys four functions:

* A medical evacuation by air.
* A transfusion requirement for Type A Positive blood.
* One immediate requisition for a 19K30 MOS tank commander.
* Location for pick up of casualty.
* Notification to graves registration and the S1 when wounds are fatal.

1.2.3.2 S4/Logistics.

1.2.3.2.1 The S4 is primarily responsible for logistics/maintenance planning within the battalion. He identifies the requirements for logistical support and balances on-hand material against proposed courses of action. It is for this reason that the S4 V(INT)2 has specific capabilities. Using vehicle on-board sensors, the S4's V(INT)2 accumulates on-hand supplies of ammunition and POL. It determines consumption rates and measures these rates against projected operations. When an immediate need arises, the S4 can divert material already enroute by changing route data to the transportation platoon. Maintenance planning is conducted in a similar manner through the BMO and the battalion maintenance platoon. The detailed V(INT)2 operations

of the transportation and maintenance platoons are in subsequent paragraphs. Examples of how the S4 plans and executes his duties using $V(INT)^2$ are as follows:

* Road Marches.

The S4 plans the movement of the battalion selecting routes and order of march based on S2/S3 recommendations. He uses the $V(INT)^2$ to display start points, routes, release points, and order of march. The $V(INT)^2$ establishes rate of movement to achieve start and release point times and transmits data to subordinate elements.

* Supply Routes.

The S4 selects supply routes within the battalion area of responsibility. The $V(INT)^2$ provides the S4 with the location of vehicles (by type load) while on the supply route. It also transmits supply point locations to user units and transporters.

* Supply Priorities.

The S4 uses the $V(INT)^2$ to keep a continuous update of the status of ammunition, POL, and supplies in the battalion. The on-board sensors provide the S4 ammunition and POL usage rates allowing the S4 to shift priorities based on immediate consumption as well as projections.

* Maintenance Activities.

The battalion maintenance support allocation is determined by the S4 in conjunction with the priorities established by the S3. The S4 establishes movement, location, and policies within the battalion service

support capability. In addition he maintains the status of parts and end items, matching them with personnel availability provided through S1 channels via the V(INT)2.

1.2.3.2.2 Support Platoon. Each vehicle in the support platoon is equipped with a V(INT)2 which provides the platoon leader/S4 with an accurate status of battalion logistical support. The display is primarily a map system with both large and small scale capabilities. Large scale is used to display routes from brigade trains to company resupply points. The S4 or support platoon leader selects the appropriate route for each class of supply based on V(INT)2 analysis. Proposed unit supply points are designated by the S4 as part of his overall support planning. These points are displayed as on-call information to the unit and as continuous information for each support vehicle. Additional information concerning obstacles or congestion on routes allows the vehicle to avoid major delays by changing routes. The S4 can divert supplies enroute simply by identifying the appropriate vehicle and changing its route to the new location. On the small scale map the vehicle receives information concerning the route and local friendly and enemy forces. Air attack warnings and protective measures are displayed on the V(INT)2 to reduce vulnerability. Friendly forces are displayed on a small scale map to facilitate link up.

1.2.3.2.3 Maintenance Platoon. The maintenance platoon is a diverse organization which operates simultaneously at multiple locations

as shown in figure below. Similarly the $V(INT)^2$ for the element has large and small scale mapping capabilities.

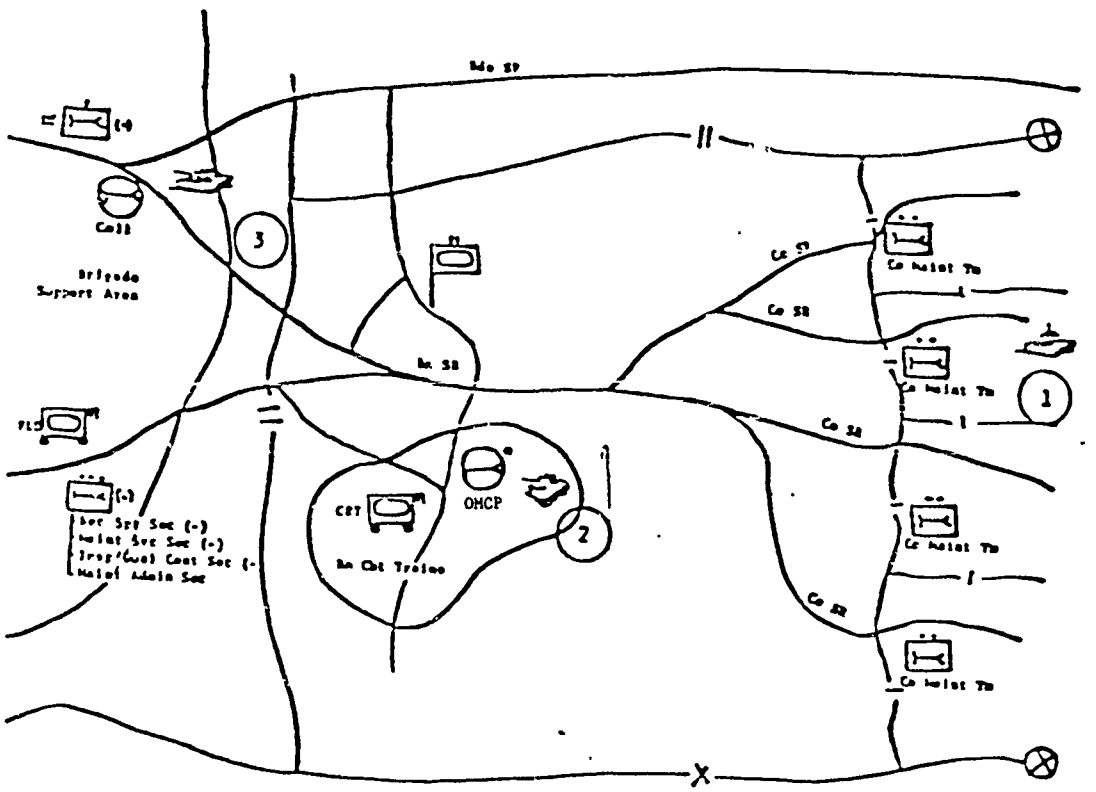


Figure 2.3. Battalion Maintenance Assets.

Each echelon of the maintenance element serves a separate function. Company maintenance elements work directly with forward company elements and are normally tasked with the same unit. The company maintenance team V(INT)^2 is capable of netting with any company within the battalion. Since a maintenance "slice" accompanies a task organized company to its new task force, the maintenance section V(INT)^2 is capable of netting with both its parent and new HQ staff elements. When the team identifies a maintenance situation beyond its immediate capability, the V(INT)^2 automatically transmits the problem, repair parts requisition, or recovery requirement to the combat/field trains. The link between the Simplified Test Equipment (STE) and V(INT)^2 allows the diagnostic equipment to transmit directly to the Quality Control and Administration Section. Using this capability, decisions concerning maintenance priorities and allocations can be made by the S4/BMO from any location on the battlefield. Additionally, the location, status, and capability of recovery vehicles are immediately available to assist in speeding the removal of repairable equipment to the appropriate level of repair capability. The battalion field trains is co-located with the brigade trains and nets directly with the Direct Support (DS) maintenance elements. This net allows cross leveling of equipment, repair parts, and service support across the division. This DS link allows the S1 to monitor the status of personnel remaining with disabled vehicles.

2. Command and Control Restrictions. The information provided by the V(INT)2 is limited only by the filters or limitations imposed on the information it generates. The V(INT)2 serves a vital role in providing essential information to the decision maker; however, too much information will complicate rather than simplify the decision process.

2.1 Information Filters. A function of the V(INT)2 is to provide appropriate information to the appropriate levels of command. There are three types of information.

* Continuous Information (CI) - data which is automatically and continuously provided (e.g., map, subelement locations, enemy situation).

* On-Call Information (OI) - data which is available but not automatically displayed (e.g., ammunition status).

* Demand In-Put Information (DI) - data which is available only on coded release from higher headquarters (e.g., company or battalion element locations, other than adjacent platoons). This data is related primarily to changes in mission.

The value of limiting and tailoring information is to ensure adequate information is available to make sound decisions without overwhelming the decision maker.

2.2 Information Limits

2.2.1 Downward Flow. Individual vehicles can obtain information from other vehicles within the immediate area but, other than IFF, cannot tap information directly from any unit to which it does not have an

access code. Access codes, like prefixes, identify the operational unit. Special (generic) codes for coordination (ground, air, or air/ground), relief in place, link up, and passage of lines are preindexed from the CEOI and used as required. Likewise, the maximum level to which the individual vehicle can transmit is battalion. With the exception of generic codes mentioned above, no vehicle in a unit can receive from a vehicle or unit to which its HQ element does not have access, unless the vehicle is within IFF required ranges (e.g., left or right boundary vehicles).

2.2.2 Upward Flow. There will be some temptations for the use of forward vehicles by commanders from higher echelons to direct the battle. Two problems result. First, the command perogative of intermediate commanders in undermined; and second, the higher level commander tends to neglect decisions at that level in lieu of making lower level decisions. The upward flow of information is restricted to three echelons as shown on the chart below:

RECEIVES FROM			LEVEL OF UNIT	TRANSMITS TO		
Bn	Co	Plt	Ind. Veh.	Plt	Co	Bn
Bde	Bn	Co	Plt	Co	Bn	Bde
Div	Bde	Bn	Co	Bn	Bde	Div
Corps	Div	Bde	Bn	Bde	Co	Corps
Cat III	II	I		I	II	III

Category I Common Transmissions - all information available.

Category II Normal Transmissions - information restricted to preformated messages, intelligence, and logistics information. All other informtion received from Category I source.

Category III Emergency Transmissions - usually of immediate nature and short duration - requires an override of the system module. This override could take place automatically if certain stations fail to transmit or are destroyed.

3. Training. Training with the V(INT)^2 falls into two functional areas.

3.1 Individual Training

3.1.1 V(INT)^2 Operation. The V(INT)^2 is a "user friendly" system. Full capability to train individual users in all facets of V(INT)^2 operation is provided independently at each user station without the requirement to start up and establish communications with other user stations. The training is self-paced, self-managed, and fully effective without supervision. The station retains a record of the operator skill

level reached in the training, and uses this record to modify the combat operation of the system to help compensate for user lack of knowledge or skill. The V(INT)^2 station notifies the user, at the time preoperation turn-on and checkout procedures are executed of any additional or refresher training needed.

3.1.2 Weapon-System Operation. The V(INT)^2 provides system-embedded training for critical individual crew station operation tasks. Training is enhanced by the system's ability to simulate both combat and vehicle component funtions. Both task and collective training for individual vehicles is coordinated by way of plug-in memory modules at the individual vehicle level, or down-loaded from the battalion V(INT)^2 training data base through the communication system. Standardized performance-testing is also provided for all users, with training readiness assessments compiled upwards at each responsible supervisory level. This data base then becomes part of the operational readiness reporting system.

3.1.3 Crew Simulators. Modular crew station simulators are provided at locations where weapon system vehicles are not available for training. Such simulators are used in units to supplement on-vehicle training based on an optimal mix of weapon systems and simulators according to cost-effectiveness considerations. These simulators provide essentially the same training in V(INT)^2 and weapons system operation, but with reduced-fidelity and less costly hardware. The crew station

modules interconnect with large-scale networks to support collective training at all levels. This allows leader tactical multiechelon training to be conducted on a frequent basis without involving large scale maneuvers or exercises.

3.2 Collective Training

3.2.1 Home Station Drills and Exercises. Collective training is provided by plug-in hardware/software packages at each level of command. These packages control and coordinate the operation of crew and platoon training simulations at home station, providing crew and platoon drill training for important collective tasks. The collective training packages are further capable of interconnection with and among headquarters and supporting elements in large-scale gaming networks, providing simultaneous training exercises at widely distibuted training sites. Large scale networking enables multiechelon training with a variety of levels of command and size and composition of units. The large-scale gaming networks permit interconnection and compatible operation of both on-vehicle simulations and modular crew station simulator, providing interactive training for active and reserve component units on a frequent basis without incurring travel costs.

3.2.2 Field Training Exercises. Vehicle mounted plug-in modules provide exercise control and coordination of tactical exercises during field maneuvers. These modules support a full range of tactical maneuver training, from small-unit situational training exercises (STXs) in small

local training areas to large-unit field training exercises (FTXs) in main training areas up to the National Training Center in size and complexity. The system is capable of providing either a simulated opponent force (OPFOR), or an engagement simulation system for force-on-force exercises. The field training system also nets with the large-scale gaming system to permit interactive multiechelon training with appropriate command and supporting elements at separated training sites, both in the field and at home station.

3.2.3 Training Management. Software is provided at appropriate command levels to support the execution and coordination of all training management functions through the same large-scale networking capability used in the tactical training exercises. The arrangement avoids duplication of computer hardware, insures compatibility of software, and provides smooth integration and coordination between planning, training, and evaluation activities. The V(INT)[2] diagnosis training weaknesses and uses this diagnostic information to recommend future training programs.

III COMPANY

The four combat companies of each battalion in Division 86 are carefully structured to enable each company the option of fighting the enemy either as a pure tank or mechanized infantry unit or a cross attached team. A company consists of three platoons with each platoon containing the optimal configuration of four tanks and/or IFVs as determined by METT-T. The function of the company is to defeat the enemy as an integral part of the battalion task force.

4. Command and Control

4.1 Company Commander

The duration and pace of future combat operations and the increasing complexity and volume of communication loads dictate that the company commander be primarily a combat leader. The combat leader rapidly collects and analyzes information, makes decisions, communicates orders, coordinates support and provides direction in response to increasingly rapid changes on the battlefield of the future.

Division 86 doctrine simultaneously requires that the company commander must be a fighter. The company commander must be track mounted, well forward in the battlefield at the most critical point of combat.

No other level of command so thoroughly demands the leader to function in a dual capacity both as a planner and executioner.

4.2 V(INT)^2

Because of the dual nature of the company commander's planner-executioner dimensions and the company's pivotal role in combat, the potential of V(INT)^2 is best appreciated at the company level. The revolutionary capabilities of V(INT)^2 impacts forcefully on every informational and behavioral level of troop leading procedures, pervading all aspects of tactical employment. This evaluation focuses on the more fundamental issues of company operations and troop leading procedures with selected examples to illustrate V(INT)^2 applications. The following analysis of V(INT)^2's doctrinal implications at company level is outlined according to the fundamental steps of troop leading procedures, and illustrates how V(INT)^2 streamlines these procedures.

The analysis begins with the formal operations order from the battalion/task force to the company commander. Then the company commander's pre-analysis of the order, backward planning, and issuance of the warning order is considered. Next the six steps common to the planning of both offensive and defensive operations are treated in considerable detail leading to the issuance of the company commander's operations order. The discussion then shifts to V(INT)^2's doctrinal implications for the company commander's supervision of actual combat operations. Finally the analysis addresses some important psychological impacts of V(INT)^2 on the behavior, attitudes, and morale of leaders and subordinates.

4.3 Operations Order and V(INT)^2

The company commander's role as a leader and planner are emphasized in this section while the V(INT)^2's role in actual combat and execution are outlined in the platoon and vehicular sections. Ideally, every company commander's plan originates from, and further refines, an operation order received from higher battalion/task force headquarters. The informational demands of modern command are complex and detailed. Yet the pace of combat makes written orders unsuitable at company level, and rare at battalion level.

V(INT)^2 provides commanders at every level complete, well-organized, and permanently recorded operation orders in a level of detail tailored to their particular areas of influence and interest. Specific V(INT)^2 applications to planning stages at the company level are discussed in the following section on troop leading procedures. It may be helpful to briefly highlight the broader applications of V(INT)^2 for the formulation and transmission of the battalion/task force's operation order to the company:

4.3.1 omniscience -- V(INT)^2 provides a revolutionary capability to "see the battlefield" and automatically incorporate the entire range of tactical and topographical information including real-time annotations. This capability provides brigade and battalion headquarters with unprecedented opportunity to formulate detailed, effective, and thoroughly orchestrated contingency plans.

4.3.2 simulation checks -- Similar to the company level simulations of offensive and defensive scheme of maneuvers discussed later, higher echelon units are able to pretest and revise various operational plans and courses of action (e.g., maneuver, fire coordination, intervisibility, attrition) on detailed digitized maps of the actual battlefield terrain.

4.3.3 simultaneous transmissions -- Operation orders are automatically distributed to the appropriate levels (e.g., company HQ, platoons, attachments) and the entire concept of operations is transmitted to all levels simultaneously at their respective V(INT)^2 stations. This capability does not override company commander inputs and decision making for normal operations, nor provide information overload to lower units. The mission information transmitted is selectively filtered to meet the needs of various recipients. The potential for simultaneous transmission is realized most during the "press" of real-time combat. V(INT)^2 allows bypassing of traditional but time-consuming command channel transmissions during such times as when casualties have severely disrupted chain of command structure.

4.3.4 security -- In addition to V(INT)^2's potential for maximizing operations security in terms of sophisticated reconnaissance, collection and analysis (e.g., automated intervisibility and masking graphics), the use of digital burst transmission creates a relatively impregnable mode of communication which is reinforced by the built in

encoding and decoding software programs aboard target vehicles. Intra-vehicular communication also reduces co-location of members of the orders group in a vulnerable assembly area when combat conditions (e.g., NBC contamination) pose an extremely hazardous environment.

4.3.5 uniformity -- The integrity of the upper echelon's mission statement and concept of the operations is communicated in accurate and precisely integrated sub-statements to the lower echelons. Tactical information unique to the current mission (e.g., check points, coordination points, TRPs, passage of lines) are thoroughly detailed to the degree appropriate to each respective audience and more generic information (e.g., SOPs, battle drills, CEOI signals) are standardized across battalion sub-units by computer stored formats, procedure and maintenance checks, etc.

4.3.6 comprehensibility -- V(INT)^2's capabilities for "smart map" terrain representations and automated orientation controls (e.g., vehicle location, position designation, etc.) provide the basis for more meaningful communications based on visual imagery. Communication is enhanced by non-verbal, imagery processing modes (e.g., graphics, diagrams etc.) to ensure rapid and thorough comprehension with strong memory cues.

4.4 Troop Leading Procedures

4.4.1 Receive the Mission

Upon receipt of the Battalion/Task Force Order the company commander begins an overview analysis of the company's mission

and the purpose of that mission in the broader context of entire task force or battalion's concept of operations. V(INT)^2 eliminates the time consuming, vulnerable travel of the company commander, XO, and FIST leader to the battalion command post.

The downward flow of information from the battalion to the company commander will be filtered to the level of information dictated by the commander's immediate area of influence and anticipated areas of interest. While an overview of the battalion's mission is important for a meaningful analysis of how his company is to support that mission, the detailed tactical information received by the commander is restricted to the area of his particular mission. In general company commanders are provided a set of orders which focus on the company's immediate zone of action as directed by the task force. Tactical options (e.g., avenues of approach in offense) are more restricted at the CO/TM level to ensure unity of effort within the task force.

Demand input statements would enable the company commander to request various data bases pertaining to broader areas or high echelons. This is particularly true of companies with reserve missions. On the basis of V(INT)^2's detailed terrain and data base generation of the operations orders, the company commander's mission analysis and planning operations are faster, more accurate and complete. The initial step of backward planning to prepare the warning order is computer assisted and verified by utilizing V(INT)^2's time sequencing algorithms.

4.4.2 Issue A Warning Order

V(INT)2 streamlines the content of the traditional warning order. Pre-formatted displays selectively transmit information directly relevant to the various addressees (e.g., FIST, 1SG, etc.). On the basis of prior analyses, however, V(INT)2 supplies each recipient a much more detailed concept of the operation in terms of their immediate concerns and preparations. For example, platoon leaders may receive along with their warning order digitized maps of their anticipated battle positions or routes to initiate simulated terrain reconnaissance. Time estimates and schedules will be based on real-time contingencies (e.g., continuously updated logistic and tactical data and issues such as attachment and detachment requirements) serve as a reliable and compelling index of preparatory needs.

Finally only time for the receipt of the entire order may be required in the warning order if, for example, the company employs a standard SOP that V(INT)2 vehicular stations are the place. Again such an SOP reduces time and danger factors associated with order transmission.

4.4.3 Planning Operations

The most critical task that distinguishes the company commander role as a commanding officer versus a fighting soldier is his responsibility for planning and supervising the company mission. The following six sections serve as the standard outline for conducting

planning operations in both the offensive and defensive mode. V(INT)^2's impact on each of these planning stages is discussed or illustrated with selected applications in offensive or defensive missions.

4.4.3.1 Analyze the Avenues of Approach

As the company commander begins his planning operations his attention must shift to the actual combat terrain designated for the company's mission. Consistent with the commander's own concerns and V(INT)^2's hierarchical scheme of planning criterion, the shift to terrain related factors reflects the third level of METT-T, with the mission and enemy components contained in the preceding operations order.

4.4.3.1.1 Reconnaissance

In both the offensive and defensive modes of planning, doctrine strongly urges that terrain analysis be based on actual ground reconnaissance rather than map reconnaissance. Real-time and enemy factors often force commanders to make-do with piecemeal reconnaissance or map referenced terrain analysis. For that area of the operation which involves unseen terrain, only tentative orders are given. These orders are verified or amended as the battle and vantage points progress. V(INT)^2's digitized map data base of the actual combat terrain provides a more accurate picture of terrain and allows for more accurate planning. This digitized mapping system:

- Depicts key terrain features with high resolution and fidelity and at any contour or scale level selected by the company commander.

- depicts portions of the terrain near to, or within, the company commander's entire areas of influence and interest.

- superimposes on the terrain map any tactical informational markings selected (e.g., TRP, checkpoints, passage of lines, boundaries, etc.)

- designates the exact location of selected terrain or tactical features including their range, coordinates, azimuth, elevation.

- annotates and automatically updates V(INT)^2 vehicular maps on the basis of reconnaissance reports, changes in task force/company/team operations orders or actual combat developments.

- simulates selected elements of the mission scenario (e.g., maneuver to action or contact by friendly or threat vehicles with attention to factors such as maneuver space, choke points, obstacles, masking, line of sight, intervisibility, etc.)

- V(INT)^2's vehicle locating capability lays out complex movement patterns (e.g., linkups, converging routes, successive sector) of the reconnaissance patrols and orchestrates or monitors their movements when initiated. In addition the digital burst transmission capabilities of V(INT)^2 enables the force to make timely and highly accurate intelligence reports and map annotations. These messages are simultaneously transmitted to both upper and preselected lower units (selection established, perhaps by SOP) in an operations secure mode.

4.4.3.1.2 Precise and Complex Processing

An overriding virtue of the V(INT)^2 system is the accuracy inherent in computer-based information processing. The need for accuracy in communication is self-evident, but particularly important in the area of navigation and map reading capabilities for both planning and conducting military operations. The digitized terrain data base and smart-map capabilities of V(INT)^2 ensures that selected topographical or tactical landmarks (e.g., key terrain, checkpoints, TRPs, etc.) are precisely and uniformly displayed across every echelon level desired. These features are displayed in a manner readily comprehensible, with any member of the V(INT)^2 team able to verify his own map interpretation (e.g., from his own designated vehicle position, the designated position of any "known" terrain feature, by interactive guidance or orientation from other friendly vehicles, etc.). Both this and the supporting sections of this document illustrate how V(INT)^2 makes obsolete many of the complex, impractical and extremely error prone "tools" of the traditional commander and soldier (e.g., grease and stubby pencils, range cards, strip maps, overlays, personnel records forms, etc.).

A second feature of V(INT)^2 is the system's capability for processing complex multiple informational features, and generating and pretesting tactical issues or alternatives. An example of this capability is the V(INT)^2's analysis of avenues of approach in the defensive mode. The company commander defines the enemy's avenues of

approach by initially re-reading the first paragraph of the operations order, enemy situation. On the basis of the threat's composition, disposition, and doctrine the company commander then determines the avenues in the terrain that the threat is most likely to employ and in what manner and sequence. Ideally he should determine avenues for front, rear, and flank attacks and for subsequent attacks. Traditionally company commanders are trained to conduct this analysis by moving a plastic template (e.g., of a threat motorized rifle battalion, 1:50,000 scale) over the entire set of potential avenues and simultaneously calculating and recording maneuver space, trafficability, weapons range, intervisibility, engagement windows, and closure rates, etc. This procedure is clearly time consuming, complex, laborious, and inaccurate. V(INT)^2 analyzes the multiple avenues of approach and <u>continually</u> refines that analysis providing accurate and timely information to the commander. Once these analyses have been conducted by V(INT)^2 they are stored in memory in the order of prioritization established, accessible for immediate utilization in the event that the threat appears on alternative avenues. The flexibility of V(INT)^2 to preplan and store operational plans ensures that company operations are continuously directed even when the tactical situation changes.

4.4.3.2 Select and identify tentative positions/develop courses of action.

One of the most critical elements in the planning of offensive and defensive operations is the exploitation of terrain factors as determined by threat location and actions. A mirror-image reversal underlies tactical decision making in offensive and defensive modes. This reversal is apparent in the selection and identification of terrain positions; the bottom line is "see the battlefield."

In offensive operations the thorough application of this principle allows the company commander to impose his own will on the enemy by setting the course and pace of the battle. The company commander is thereby able to press the initiative, maintain an aggressive attitude, exploit enemy weaknesses, anticipate obstacles and overcome unforeseen contingencies.

$V(INT)^2$ capabilities assist the company commander's effort to identify and verify both "known and likely" threat positions. The distribution of reconnaissance information provides the company commander with updated and precise threat locations. The $V(INT)^2$ system stresses the fusion of sensor intelligence, display, and C^3I capabilities which permits the commander to react faster than the enemy.

In addition to information concerning the enemy situation received from both battalion/task force operation orders,

reconnaissance, sensors and surveillance devices, V(INT)^2 provides the company commander with digitized maps of the enemy's terrain. Given the V(INT)^2's mapping system the company commander can study the map display of the enemy's area at various speeds, angles and resolutions. In the absence of more informative intelligence reports this capability of visually exploring the potential area allows the company commander to use his own tactical skills to predict the enemy's position. Multiple potential enemy locations can be analyzed, targeted, and stored in a prioritized fashion for immediate recall. These can be updated in the event that later intelligence reports or company observations reposition these enemy locations. Using V(INT)^2 data the company commander further refines his plan for the creation of weak points, company reactions to enemy positions encountered along the avenues of approach, and danger areas within the maneuver routes (e.g., V(INT)^2 calculated kill zones, range of enemy and friendly fires, intervisibility and masking graphics).

For defensive operations the company commander's selection of tentative firing and hide positions begins two levels lower, beyond platoons and down to individual weapons systems positions. The deployment of the company's forces within the battle positions designated by the battalion/task force order is perhaps the company commander's most critical planning consideration in the defensive mode, and possibly the most complex. The selection of the "occupy" positions requires that the company commander position his forces in

predesignated topographical sites which simultaneously maximizes their cover, concealment, and lethality. Ideally, these sites represent preferred terrain and are thoroughly prepared battle positions. A tactical and psychological price must be paid when the company is forced to disengage and reposition at the supplementary "prepare" and "recon" battle positions This price must be weighed against the risk of decisive engagement.

The company's battle positions should maximize lethality and minimize risk. The company commander must concurrently process the wide range of information relevant to these criteria:

- Does the BP provide fighting positions capable of delivering effective fires (especially flanking fires at optimum ranges) in accordance with the associated fire control technique (TRP, engagement area, etc.)?

- Does it provide cover, especially hull down or reverse slope positions concealment, and long-range observation?

- Does it avoid obvious targets for direct/indirect fire suppression?

- Are there adequate concealed routes in and out?

- Is it large enough for the force assigned? (This is a tricky one, but as a general rule each platoon will require 500m to 700m of front and 400m of depth in order to provide primary and alternate fighting positions as well as hide positions.)

- In nuclear or chemical environments greater dispersion in depth may be required. Dispersion between platoons, space for other company team elements, alternate and supplementary firing positions and, of course, the terrain and enemy situation must also be considered.

- Do the graphics employed mark identifiable key terrain?

In addition to the these factors the company commander must carefully consider the tentative position's effect on the concentration and control of his unit's direct fires. In general he must delineate engagement areas and target reference points but more specific concerns for fire control measures are as follows:

- Is it located on or in immediate proximity to likely enemy avenues of approach?

- Can it be hit by at least one of the weapons positions assigned to orient on it? (Adjustments to TRPs or weapons systems locatons may be required for night and limited visibility.)

- Does it allow the concentration of multiple direct fire weapons systems (preferably of two or more company teams)?

- Is it associated with a natural or man-made obstacle which will optimize weapons effects (e.g., increase flank engagements, deny cover, etc.)?

- Is it marked by readily identifiable terrain or man-made features (remember to consider the thermal image it will present)?

- Are the direct fire control techniques and graphics as simple as possible, while still providing sufficient control for the commander to implement his battle plan?

This preceding catalogue of battle position guidelines does little to depict the actual complexity of the company commander's decision. Locating battle positions requires an astute capability for interpretive map reading and the painstaking preparation and coordination of multiple calculations and overlays such as dead space, intervisibility and masking diagrams, TRPs, engagement areas, range cards, fire orientations, and closure rates. The same procedures should be repeated for the "prepare" and "recon" battle positions and for alternative avenues of approach.

V(INT)^2 facilitates this battle position selection process by identifying tentative positions based on the characteristic of an "ideal" position. It then generates graphic displays for the company commander's consideration in an interactive mode. The commander designates the location of various friendly elements on the digitized map of the battle position. The V(INT)^2 generates near instantaneous graphic displays of the battle position selection criteria in any preselected order or in a composite display as requested. On the basis of rule-based tactical algorithms, the V(INT)^2 initiates the selection process and pretests various position configurations resulting in an optimal selection <u>suggestion</u> for the company commander's evaluation.

4.4.3.3 Allocate space and task organize/develop the maneuver plan. In defense planning the allocation of space and task organization is an integral part of the selection of tentative positions. For example, company commanders must consider battle positions down to the level of individual weapons systems to ensure that sufficient space is allotted to each platoon, (i.e., to optimize and coordinate fields of fire and maneuver to alternate firing positions, hide positions, and eventually supplementary "prepare" and "recon" positions). The commander does not give the individual positions to the platoon leader but compares the platoon leader's selection against his own when his V(INT)^2 displays the platoon's actual weapon's placement. Similarly many of the factors relevant to task organization were included in the previous planning states (e.g., avenues of approach, range cards, engagement windows, etc.).

V(INT)^2's capability for streamlining the steps for troop leading procedures will, in fact, consolidate and more thoroughly integrate these procedural guidelines. For example, task organization is almost immediately derivable from the data bases and graphic displays generated by V(INT)^2 for the selection of battle positions.

The usefulness of V(INT)^2 for both planning and controlling combat operations depends on the clarity and interpretability engineered into its graphic symbology. The V(INT)^2 uses standardized

symbols and control measures but simplifies and refines information formats to reduce display clutter and enhance information integration. Current military symbols and formats are reviewed and used for V(INT)[2] whenever possible. New symbology is adopted when proven to be more effective. For example, the execution matrix (Figure 4-1) represents an extremely compact and effective format for depicting, recording and updating the commander's allocation of space and task organization for company battle positions.

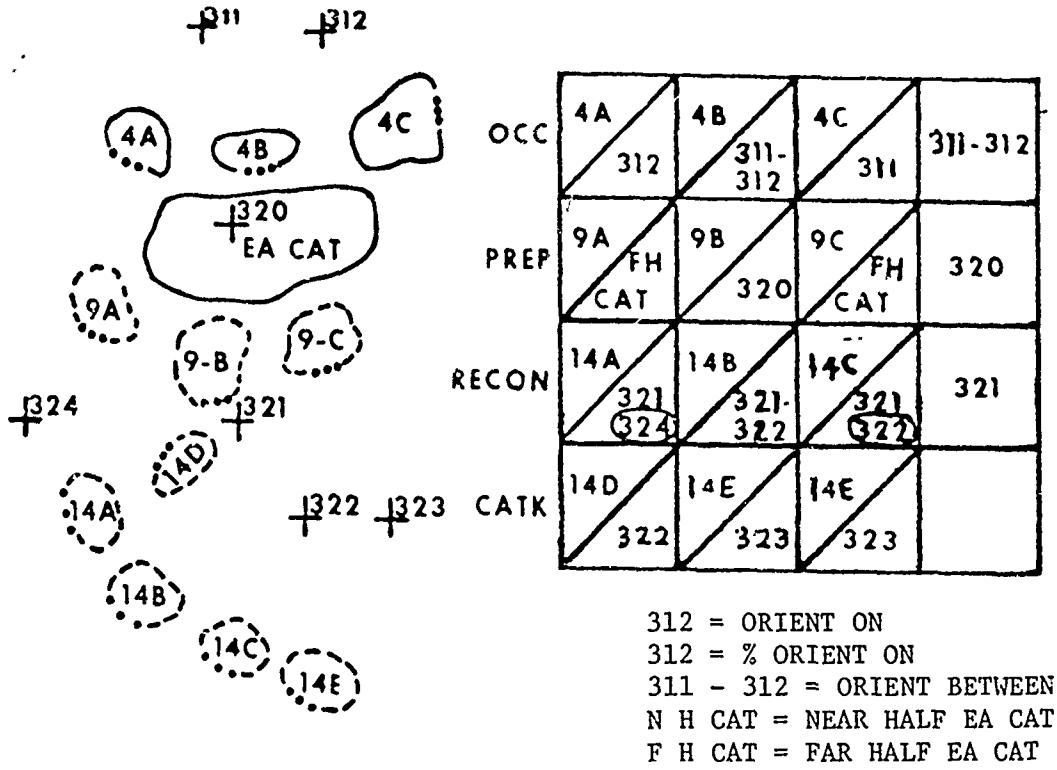


Figure 4-1 Platoon Battle Positions and Execution Matrix

V(INT)^2 generates the matrix directly from the commander's annotated battle position graphics on the display. Additionally matrices are determined for V(INT)^2's self-generated "advisory" selection of tentative positions previously discussed. This matrix format affords near real-time overviews of combat developments (for the company commander) and provides a ready system for directing and coordinating (platoon leaders) changes in the mission plan.

V(INT)^2's impact for offense planning is again considerable. One of its advantages is the capability for simulating and wargaming the company's scheme of maneuver over actual terrain routes. Use of appropriate scale and contour levels coupled with oblique perspectives provided by the digitized map, provides commanders with an unprecedented degree of planning explicitness and detail. Additional implications for the actual maneuver include the precise designation and location of obstacles, check points, formation-change indicators, TRPs, coordination points, and overwatch positions, etc.

4.4.3.4 Integrate fires and obstacles.

Success on the battlefield is determined by rapid and accurate distribution of fires. The volume and distribution of fires are controlled by various personnel at all levels from the company commander down to individual gunners and infantrymen. The intensity, stress, and complexity of combat engagements, however, require minimum times, precise coordination and rapid execution.

Traditionally commanders have relied upon established SOPs and fire plans to instill nearly reflexive destructive capabilities in their troops. V(INT)^2 expedites this process by validating and generating well-coordinated fire plans. For example, in the defense of battle positions individual units are assigned to their primary and secondary sectors of fire. These sectors must be readily identifiable by prominent terrain features and are assigned to insure that an area is completely covered by fire and observation. Upon assignment to a sector, platoon leaders and other weapons systems personnel prepare sketch maps of their area of responsibility. These sketches include additional overlays which depict the ranges and coverage of their respective weapons, TRPs, engagement windows, intervisibility diagrams, dead spaces, etc. for:

* each of their primary and secondary sectors,
* their original and alternative weapon's orientations within each sector, and
* their "occupy", "prepare", and "recon" positions.

These sketch maps and overlays are delivered to the company commander and re-sketched into a composite fire control plan for the entire battle position. Estimations and sketch illustrations must be sufficiently precise to identify any gaps, weaknesses, or blind spots in the fire control plan. V(INT)^2 performs all of these functions for the commander, creating a precise composite sketch of the company's overall fire control plan.

The interactive nature of V(INT)^2 permits the company commander a variety of extremely simplified options for developing his tentative fire control plan. By annotating onto the digitized map his tentatively selected tank and weapon positions, V(INT)^2 instantaneously derives the calculations and sketches required. Additionally, once the platoon leaders provide the actual positions the commander then compares and evaluates these positions against his tentative plan. The commander's V(INT)^2 then pinpoints with warning symbols any weaknesses or deficiencies in the plan such as blind spots or fire integration plans likely to result in either overkill or underkill (e.g., gaps). The commander adjusts his platoon to eliminate problem areas. V(INT)^2's generation of a fire plan and the system's <u>evaluation</u> of the plan's adequacy incorporates <u>all</u> of the previous planning considerations including enemy composition and probable avenues of approach.

The dynamic nature of offensive planning requires extended (topographically), complex, and sychronized fire plans. Within his scheme of maneuver to the objective he must select routes and formations that result in the best balance between security and speed. The company commander anticipates probable engagements or observations by the enemy while his company is enroute to the objective. If properly anticipated weapons and observers are oriented prior to the point of engagement and employed with the timely use of suppresive fires and smoke.

V(INT)^2's ability to suggest maneuver routes which maximize cover concealment and bypasses greatly reduce ammunition expenditure and time. For example, if the company is to move through terrain that is a likely or known enemy location, V(INT)^2 identifies vantage points for overwatch positions. The V(INT)^2 gives the commander the ability to continuously monitor platoon and company formations in relation to each other. The terrain and threat developments via the display serve to maintain the integrity of the company's maneuver and subsequent assault.

In the first phases of the assault V(INT)^2's topographic analysis permits the commander to locate the base of fire platoon at the most lethal/secure position obtainable (e.g., within a 800-1500 meter range of the objective).

The timing and coordination of both direct and indirect fires are extremely critical in the assault. V(INT)^2's ability to automatically monitor and transmit the exact location of friendly vehicles in relation to each other, the threat, and tactical locations (e.g., TRPs, checkpoints) will provide a reliable base for synchronizing these elements. The FIST via V(INT)^2 precisely starts, adjusts, and lifts the suppressive fires of artillery along the axis of advance and on the objective even in conditions of intense obscuration (e.g., smoke, fog, darkness). Similarly the base of fire platoon's suppressive rounds maintains concentrated barrages until the last possible moment. The

V(INT)^2 provides the company FIST with a means of identifying safety zones which indicate the degree of caution which must be exercised in firing.

For direct fires an overriding mechanism coupled with friendly vehicle identification and location data precludes the possibility of accidentally firing upon friendly forces. Conversely, V(INT)^2 detects and projects where and when maneuver patterns threaten to mask the fire of other friendly weapon systems. Commanders and FISTs use flares or colored smoke to initiate a shift of fires or indicate a limit of advance only as scondary methods due to the danger of imitation by the threat. V(INT)^2's digital burst transmission provides the primary mode of communicating such critical battle information as when and where to shift fires.

As the objective is cleared, V(INT)^2 sensors identify pockets of resistance that remain and the best positions for defending against counterattack. The preparations for counterattack will already have been considered during operations planning, and V(INT)^2's assistance will be quite similar to that previously detailed in planning for battle position defense. Finally the company commander begins the reorganization of his forces and V(INT)^2's role in the reorganization is discussed in the following section.

4.4.3.5 Plan logistical support.

Division 86's reorganization of the combat service support will be greatly enhanced by V(INT)^2 communication and vehicle location capabilities. With only the supply sergeant and armorer organic to the company, basic combat service support requirements and procedures will necessitate an extremely active and efficient interface between company's needs and battalion's resources. V(INT)^2 will prove an excellent component for the streamlined logistical priorities of Airland 2000. Without detailing V(INT)^2's implications for each of the classes (I-IX) of supply, the following section will briefly highlight V(INT)^2's role in facilitating combat service support.

An essential ingredient in any supply line or service is the need for a comprehensive and continuously updated record keeping system. As discussed in related battalion sections, V(INT)^2 provides a completely automated system for tracking supply expenditures (e.g., fuel, ammo, etc.) and updating man/machine status reports (e.g., Classes I, II, VIII, IX). V(INT)^2 must be capable of transmitting logistics information concerning the vehicle on which the system is mounted. These reports must be forwarded to higher level systems automatically and/or upon direct request. This capability will provide timely and accurate reports from onboard sensors without the need for crew reporting/updates. In addition to maintaining real-time supply records, V(INT)^2 anticipates and assists in planning for resupply operations. Ideally, most of the planning and requesting of supplies will be done at the battalion headquarters on the basis of the transmission capabilities of V(INT)^2. The battalion's supply personnel (e.g., S4, BMO, etc.) directly monitor and anticipate supply operations via accurate and timely V(INT)^2 reports. The system:

- provides these personnel complete supply status reports in highly readable and logically sequenced formats.

- automatically prioritizes these needs in accordance with battalion SOPs.

- actually prepares detailed and complete supply package requests (e.g., LOGPAC) for pre-selected unit sizes (e.g., companies, platoons, etc.)

The communication capabilities of V(INT)^2 eliminates the need for such time consuming and dangerous procedures as messenger-delivered status reports or long radio transmissions. Logistical requests can be forwarded by V(INT)^2 to all appropriate personnel simultaneously and in an operations secure mode via digital burst transmissions.

Additionally V(INT)^2 aids in coordinating the movement of logistical trains and in orchestrating resupply operations. For example, the traditional SOP that company combat trains normally operate one terrain feature to the rear is a highly ambiguous directive that often results in poorly coordinated and dangerously exposed train maneuvers. The intervehicular location capability of V(INT)^2 allows either company or battalion personnel to precisely monitor and control this trailing distance and maximize delivery and security of combat trains. Resupply configurations (e.g., service station, laager, etc.) are optimally selected using V(INT)^2's highly detailed mapping and

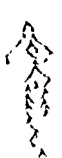
intelligence capabilities. The location of trains or prestocked supplies is transmitted to the V(INT)2 of receiving personnel.

The V(INT)2 frees key personnel such as the executive officer from predominantly admin/log assignments and enables them to more fully participate in tactical operations. Similarly, the 1SG's ability to coordinate logistic and personnel support is greatly enhanced. He can match both men and material using his status display and guidance from his commander relayed through the V(INT)2.

4.4.3.6 Record the plan/issue orders.

V(INT)2 plays a very powerful role in these final stages of the company commander's troop leading procedures. The major implications of V(INT)2 for the formulation and transmission of formal operation order have been previously detailed in the consideration of the battalion/task force's operation order to the company commander. The informational processing required for formulating, recording and issuing orders from each of these three command levels are similar.

The company commander transmits orders via V(INT)2 directly to each of the company's elments which eliminates the time-consuming and dangerous congregation of his key personnel. The company commander's option to employ intervehicular communication of the operations order enables platoon leaders and support personnel to primarily focus on their unique tasks in support of the company's



mission. For example, platoon leaders in the offense can be provided in their version of the order, detailed and terrain referenced avenues of approach that have been selected by the company commander. In addition they receive map annotations that precisely designate key terrain and tactical features (e.g., coordination points, checkpoints, and TRPs) critical to their coordination with other company elements and mission objectives. They immediately begin a detailed terrain analysis and simulated maneuver along the route(s) selected. Questions or clarifications are addressed by various on-call commands to V(INT)^2. Finally, the company commander can have each platoon and service support personnel simultaneously backbrief to V(INT)^2 his unit's role in the mission. These backbriefings are received and evaluated by the respective V(INT)^2 stations and conflicts or misunderstandings are resolved as needed by the company commander.

4.5 Combat Implications

V(INT)^2's impact on the actual conduct of combat operations as opposed to the planning of operations is detailed in additional sections of this document that focus on platoon and individual weapons vehicles The following section will briefly identify V(INT)^2's role in actual combat operations required at company level.

A major advantage afforded a comany commander with V(INT)^2 is his tremendously enhanced ability to observe and communicate with his company elements. The commander needs to see the battlefield, directly observing

and supervising the operations of his platoons in combat. Only with the immediacy of such information can the company commander swiftly and decisively deploy his elements. The V(INT)2 allows the commander to keep track of those elements he cannot directly observe. The previously discussed capabilities of V(INT)2, secure digital burst transmission, precisely designated intervehicular location, and highly detailed and continuously updated terrain and tactical map annotations are similarly designed to provide the company commander with a much more comprehensive ability to "see" and communicate with all of the elements under his command. These capabilities enable him to react to enemy actions even when he is repositioned away from the most critical point of combat operations.

After the company commander has planned, issued, and initiated the operations order, and until those plans are obviated, the company commander's role is primarily to orchestrate or control the actions of his elements in accordance with the orders. The company commander ensures that these actions are precisely synchronized and smoothly integrated while the individual platoon leaders and TCs execute the plan.

For example, in the initial stages of "actions on contact", fire and maneuver are automatic and directed by the bounding platoon leader. Prior to combat the company commander must ensure the company's

proficiency in the required battle drills and SOPs, but there is not time for his direct control when contact is initiated. Aided by V(INT)^2 the company commander, even without direct view of the lead platoon's involvement will have a highly detailed and instantaneously updated display depiction of the platoon's actions and positions. In addition he will possess similar terrain referenced locations for the overwatch platoon as well as the other platoons in the company in relation to one another and in relation to the enemy's position. This information allows him to maneuver his platoons to achieve the greatest possible results.

Given this bird's-eye view he can quickly identify and deploy that platoon best situated to develop the situation. Each vehicle sensor system and V(INT)^2 transmits terrain referenced annotations disclosing the enemy's strength, composition, and disposition. This data is automatically assimilated into a composite display allowing the commander to quickly choose a course of action and transmit it to his platoon leaders via V(INT)^2 (including terrain referenced axes and diagrams). Simultaneously the developed situation and course of action are transmitted to battalion level V(INT)^2 systems.

In summary, the V(INT)^2 enables the company commander to develop the situation, choose a course of action, issue the necessary FRAGO's and provide SITREPS as necessary with a minimum disruption to combat operations. The actions on contact scenario illustrates one of the most critical and unpredictable sequences in the coordination of company

combat operations and demonstrates V(INT)^2's capability to streamline that operation.

4.6 Human Factors Considerations

Within each platoon certain positions are particularly susceptible to psychological dysfunction due to combat stress --officers and radio operators. The following section considers the value of V(INT)^2 for armored personnel in general and those key personnel in particular. The goal of V(INT)^2 is to streamline combat procedures, not to complicate them, thus reducing combat stress and fatique.

4.6.1 Man/Machine Alliance

The doctrinal implications outlined in this document have attempted to illustrate the value of V(INT)^2 as the most powerful and efficient technological advancement in the history of armored vehicles. V(INT)^2's ability to drastically streamline and precisely execute a very comprehensive range of planning and operational procedures eases the commanders' duties. The capabilities of V(INT)^2 to decisively impact on the complete range of military operations from battle drills and SOPs to tactical decision making and actual combat performance is clearly unprecedented. These capabilities are so pervasive and supportive that V(INT)^2 takes on a new C^{3}I dimension --man/machine alliance.

4.6.1.1. Streamline vs. Overload

The previous discussion of V(INT)^2's potential impact on company level operations emphasizes the streamling, simplifying

function of V(INT)^2. An example of V(INT)^2's ability to reduce both officer and line staff workloads is detailed in the section that discusses the selection of tentative positions for platoon and weapons positions within a battle positions. Traditionally platoon leaders and company commanders have been expected to base these selections on a thorough determination (i.e., calculation) and the integration of a wide range of complex tactical factors: range cards, closure rates, dead spaces, intervisibility and masking graphics, TRPs, engagement areas, probable avenues of approach and deductions based on knowledge of enemy's composition, disposition, and doctrine. These required calculations are extremely time-consuming, laborious, quite difficult and often inadequately trained (e.g., closure rates, engagement windows, intervisibility diagrams). But with V(INT)^2 these calculations and graphics can be generated by merely designating a tentative weapon or vehicle position onto the display. A quite different but equally impressive example is V(INT)^2's capability to largely automate the combat service support operations.

As a result of V(INT)^2's ability to assume many of these tasks that must support both logistical and tactical operations the entire company will be rendered more responsive, efficient, and ultimately more lethal. Officers and soldiers will be freed from the critical but exhausting drudgeries that underly combat preparedness. Another example of V(INT)^2's ability to streamline actual combat

operations is the significant reduction in voice transmissions and the accompanying stress reduction related to that task.

4.6.1.2 Involvement vs. Isolation

Even more important than V(INT)2's ability to reduce and simplify planning and combat operations is the fact that this assistance frees personnel for other critical tasks, particularly in continuous operations (e.g., commander and XO share tasks). Key personnel are freed from logistical and communication tasks that dominate their time and attention and prevent their more effective involvement with planning, fighting and providing critical role models for subordinates. Similarly platoon leaders, TCs and platoon sergeants are able to maintain a much more personal degree of interaction and support with their men. They will also be free to rehearse and coordinate their unit's combat drills and procedures which are now, in the face of combat, increasing confidence and reducing frustration caused by inadequate information. The company, especially in pre- and post combat phases experiences a much greater degree of cohesiveness, mutual support, and leader involvement.

Perhaps the most unsettling human experience, next to the immediate injury to self or friends, is that of disorientation. The experience of feeling lost or estranged from contact with others is a basic fear that quickly shifts into generalized confusion and incapacity: If uncorrected, the condition may rapidly

deteriorate into paralyzing fear. This condition is a pervasive experiences of soldiers in combat who operate under conditions of darkness and secrecy, in unknown terrain, against dehumanized forces and amid the terrifying blast and explosions of lethal destruction.

Via $V(INT)^2$ each vehicle is able, when needed, to monitor the locations of the other vehicles in his platoon and/or company. In addition each vehicle is able to continually orient itself in relation to the plan of maneuver or operations and the known or likely enemy locations with respect to their own location, and with special demand input statements and precautions (e.g., unique voice frequency recognition) the location of the nearest friendly headquarters.

In addition $V(INT)^2$ provides audio-visual communication means far exceeding the current "buttoned-up" restrictions. The dominant human sense is vision and $V(INT)^2$ provides the members of each vehicle with the ability to "see" critical friendly, foe, and terrain features in any direction, in multiple scales and perspectives, and vastly extended range. Furthermore $V(INT)^2$ can <u>assure</u> members of different vehicles that they share a convergent view of whatever particular features may be of concern. By designating on their respective map displays the checkpoint, objective, or enemy location, etc. in question, they significantly reduce the uncertainties of tactical maneuver.

Finally V(INT)^2 is used to greatly reduce the occurrence and the fear of "missing in action." Each V(INT)^2 station emits a "homing distress signal" in an operationally secure mode to direct the search efforts of a needed recovery team. In the event that combat damage has rendered the vehicle and/or station inoperable, V(INT)^2's on-board sensors emit a last second distress and silent location alarm to appropriate personnel.

4.6.1.3 Confidence vs. Uncertainty

Perhaps the most discriminating factor that distinguishes the successful chain of command from those units that will experience defeat is confidence. The conviction or belief that one will win is especially critical in an arena of long range, fluid operations. Both an officer's and a soldier's confidence is firmly grounded in his ability to thoroughly understand what is required (e.g., see the battlefield) and his ability to decisively execute the tasks entailed (e.g., tactics, battle drills, SOPs, etc.). V(INT)^2 provides a significant advantage over the enemy in every phase of company operations previously addressed. When troops know that their company's intelligence, plans and preparations are unquestionably superior to that of the enemy, they will respond with elan. When orders are perfectly understood and coordinated among the men and resources of their unit, in the throes of combat they will know that their alliance with V(INT)^2 has forged a most formidable force.

Responses incompatible with this degree of confidence are stress and uncertainty. This chapter details the myriad implications that V(INT)^2 possesses for reducing stress and uncertainty throughout every level of company operations. Briefly consider V(INT)^2's potential for instilling confidence in two of the company's most critical and stressful personnel --commanders and radio communicators.

Up to 70 percent of communications processed by radio operators pertains to intelligence reports. Yet half of these reports lack the reliability and accuracy necessary for effective decision making. In a system operating this poorly it becomes readily apparent to both senders and receivers that crucial data is being omitted and messages that are transmitted may be dangerously misleading. The cumulative frustration of these communication efforts appears to stress most heavily upon the operators who feel most responsible for the messages they convey. But their uncertainty and the dubious nature of the "reports" must quickly erode the entire company's morale. V(INT)^2's communication capabilities, as previously discussed, provides our combatants with an unprecedented degree of accurate, thorough, and instantaneous intelligence reports. On the basis of this both radio operators and the entire company will experience a compelling surge of confidence in their company operations.

The company commander stands alone in the most critical and stressful company position. Upon his shoulders rests the often conflicting responsibilities of protecting his men and accomplishing his mission. Ultimately all decisions -- life and death -- are his. Ideally resourcefulness and independence are the benchmarks by which commanders will be judged. It is that burden of isolated responsibility that weighs most heavily on the commander in the solitude of leadership.

This chapter illustrates how $V(INT)^2$ will strengthen his command and support his requirements. But $V(INT)^2$ will also allow him to share his responsibilities, to confer with his peers and his superiors. Via $V(INT)^2$ every commander is able to confer with subject matter experts through the $V(INT)^2$'s expert data base. The system is not designed to abrogate his authority or to second guess his judgment. It serves to relieve him of any distracting and self-defeating doubts and reassures him of the wisdom in his selected course of action. The $V(INT)^2$ thus instills the single-minded, decisive mission, conviction that marks the successful battlefield commander.

IV. Platoon

The tank platoon executes battle actions within the context or framework of the tactical missions being conducted by higher headquarters. The tank platoon leader and his platoon sergeant as both section leaders and as platoon decision makers must rely on specific leadership characteristics. The special characteristics required of a tank platoon are outlined in FM 17-15. It is these characteristics which the platoon level V(INT)^2 must enhance.

Armor Leader Qualities (FM 17-15)

Sense of Awareness

Speed of Reaction

Initiative

Common Sense

Aggressiveness

It is important to recognize the three separate yet simultaneous functions of the platoon leader and platoon sergeant. While each performs his designated duties as a leader in the platoon, each is also a section leader for movement or engagement drills, and responsible for half of the total unit firepower. These critical high level tasks must be accomplished simultaneously with their duties as track commander responsible for fighting their individual vehicles.

With this three fold function, the V(INT)2 monitors and assists in these duties and renders many tasks semiautomatic.

5. Command and Control.

The platoon is primarily a fighting unit, hence the platoon leader is an executor. His tactical planning is limited to implementing the orders of the company commander. This means that most of the platoon leaders function will be reactive to the situation. He translates plans into action based on the factors of METT-T.

*Mission. The platoon leaders role as an executor of missions requires that he be able to translate company tactical missions (such as attack and defend) into action drills for the platoon to execute.

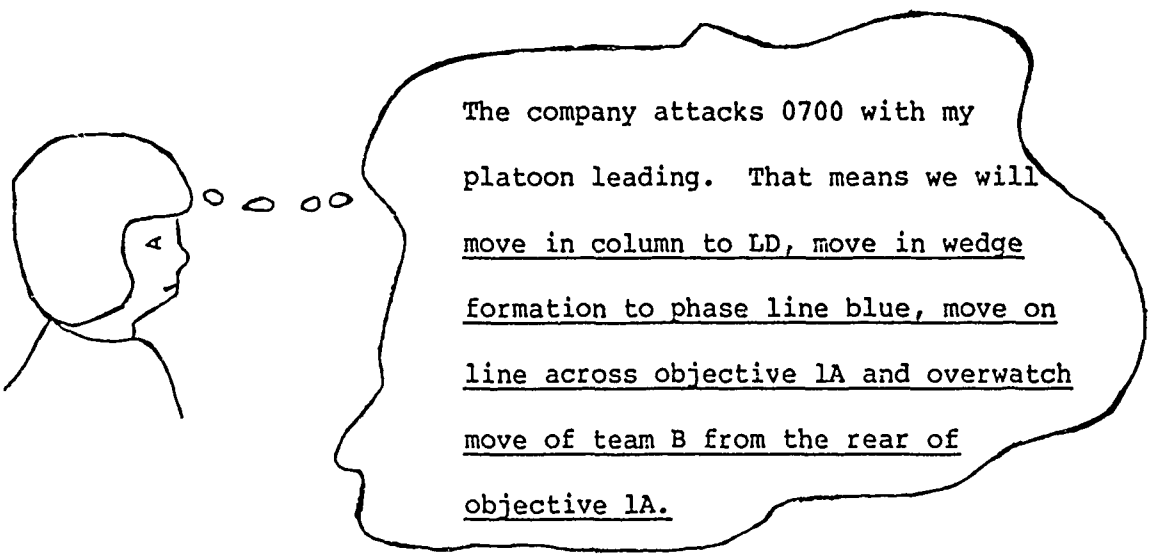


Figure 5-1. Translating the Mission.

The ability of V(INT)^2 to provide an accurate picture of the battlefield allows him to select the appropriate action drill to accomplish the company mission.

*Enemy. The platoon leader reacts to the enemy situation. V(INT)^2 depicts, in near real time, enemy information including composition, disposition, capability and intention. This enables the platoon leader to both analyze and anticipate the enemy's course of action and interdict in the most lethal manner.

*Terrain. The platoon leader receives information concerning the terrain from the V(INT)^2 internal map system. He uses this information to insure that his platoon remains properly oriented. The vehicle's position locator insures that he and the members of his platoon are appropriately located at all times. The V(INT)^2 can also identify masked areas or recommend routes on demand. This information reduces the time required for analysis by the platoon leader.

*Troops. The most significant advantage of the V(INT)^2 for the platoon leader is that it can keep him or his platoon sergeant aware of the complete status of his platoon. He will be able to continuously identify the location and direction of movement for his platoon, and receive logistical status of vehicles on demand.

*Time & Space. A valuable asset of V(INT)^2 is its ability to plot closure rates and directions. This provides the platoon leader with expected times and points of contact. This allows the platoon leader to adjust his direction and movement to achieve tactical surprise or seize advantageous terrain.

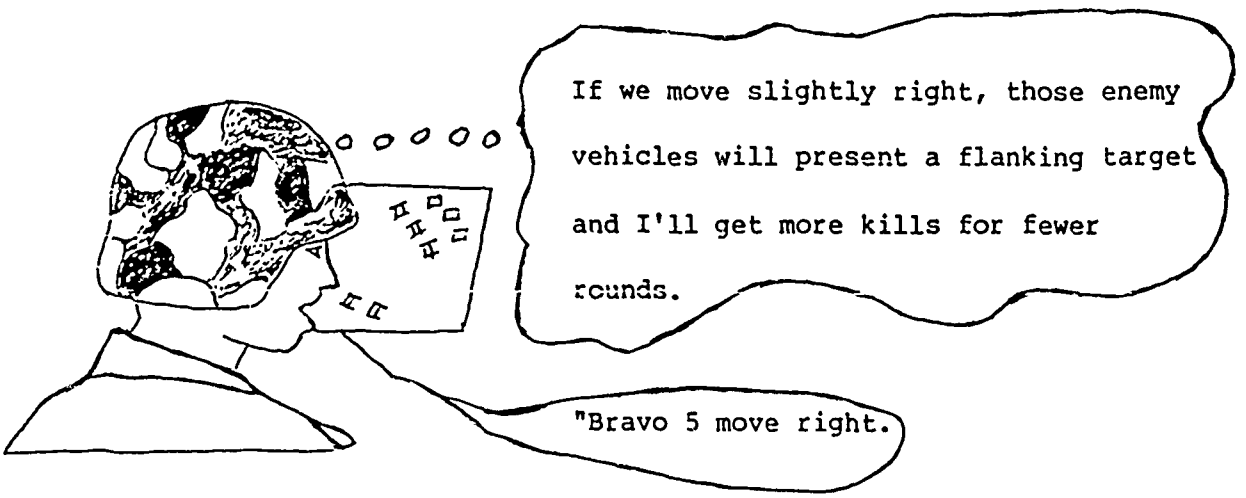


Figure 5-2. Move Right Drill

5.1 Control Measures

5.1.1 The V(INT)^2 has the capability to transmit overlays with a high degree of detail. Most of this detail is not applicable at platoon level. The symbols which will be received at the platoon level are as follows.

5.1.1.1 Assembly area -- An area in which a force prepares or regroups for further action. The platoon conducts maintenance of men and equipment, resupplies, and prepares for the next operation.

Figure 5-3. Assembly Area

5.1.1.2 Attack position -- The last position an attacking force may occupy for last minute checks or changes before crossing the line of departure. The platoon should deploy into its combat formation if the passage lane is large enough to accommodate it.

Figure 5-4. Attack Position

5.1.1.3 Axis of advance -- A general route of advance following suitable terrain for the force's advance. The unit may maneuver to either side of an axis, providing it remains oriented on the axis and objective, without interfering with other units.

Figure 5-5. Axis of Advance.

5.1.1.4 Battle position (BP) -- A location selected on the basis of terrain and weapon systems from which the unit defends. Platoon battle positions are designated by the OPORD and indicate the direction of orientation.

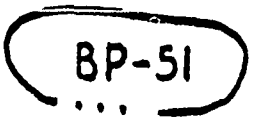


Figure 5-6. Battle Position

5.1.1.5 Boundary -- A line that deliniates areas of tactical responsibility across which units may fire direct fires against clearly identified enemy targets, but cannot use indirect fires or maneuver across without prior coordination.

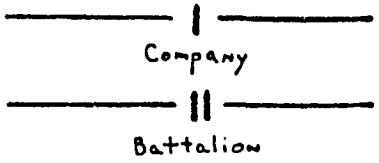


Figure 5-7. Battle Position

5.1.1.6 Checkpoint (CP) -- A predetermined point on the ground used to control friendly movement.

Figure 5-8. Checkpoint

5.1.1.7 Contact point -- A designated, easily identifiable point where units are required to make physical contact.

Figure 5-9. Contact Point.

5.1.1.8 Direction of attack -- A specific route the force must follow without deviation. It is used mainly at night.

Figure 5-10. Direction of Attack

5.1.1.9 Limit of advance -- Recognizable feature beyond which attacking elements will not advance. Also used mainly at night to avoid moving beyond the objective.

Figure 5-11. Limit of Advance

5.1.1.10 Line of contact -- Line along which two opposing forces are engaged.

Figure 5-12. Line of Contact

5.1.1.11 Line of departure -- A line designated to coordinate the commitment of attacking units at a specified time of attack. The jumping off point for the attack.

Figure 5-13. Line of Departure

5.1.1.12 Objective -- The physical object of the action taken. The location the platoon will assist in seizing.

Figure 5-14. Objective

5.1.1.13 Passage lane -- Area along which passing units move forward or to the rear to avoid stationary units and obstacles.

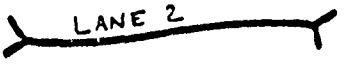


Figure 5-15. Passage Lane

5.1.1.14 Passage point -- A place where units will physically pass through one another.

Figure 5-16. Passage Point

5.1.1.15 Phase line -- A line used for control and coordination that is normally reported when crossed but not halted on.

Figure 5-17. Phase Line

5.1.1.16 Point of departure -- In night attacks, a specific place on the line of departure where a unit will cross.

Figure 5-18. Point of Departure

5.1.1.17 Target reference point (TRP) -- A point on the ground where all direct fire weapons may orient. Normally a location where the enemy can be seen first.

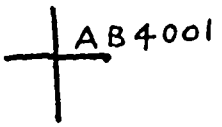


Figure 5-19. TRP.

5.1.1.18 Logistics Point -- A point location on the ground where logistical support may be obtained. Several Logistics points are:

Medical

Ammo

POL

Ammo and POL

Recovery/Maintenance

Food

Water

Food and Water

5.1.1.19 Special Locations -- Any location where an action must be conducted.

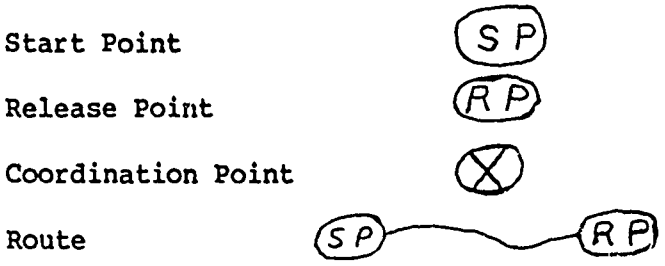


Figure 5-20. Special Locations

5.1.1.20 Friendly Symbols -- symbols which identify vehicles from friendly or allied units. The sysbols are open or white.

Special Purpose

Aircraft

Armored Fighting Vehicles

Personnel Carriers

Helicopters

Missiles

5.1.1.21 Enemy Symbols -- Symbols which identify Threat vehicles.

Special Purpose

Aircraft

Armored Fighting Vehicles

Personnel Carriers

Helicopters

Missiles

5.1.1.22 Obstacles.

AT DITCH 

MINEFIELD 

Figure 5-21. Obstacles.

5.1.2 Mission related graphics.

5.1.2.1 Matrix or Mission Box -- An abbreviated means for receiving or transmitting mission changes usually received on the platoon leader and platoon sergeant V(INT)^2 and not tansmitted to the platoon as a whole. (See Company Defense.)

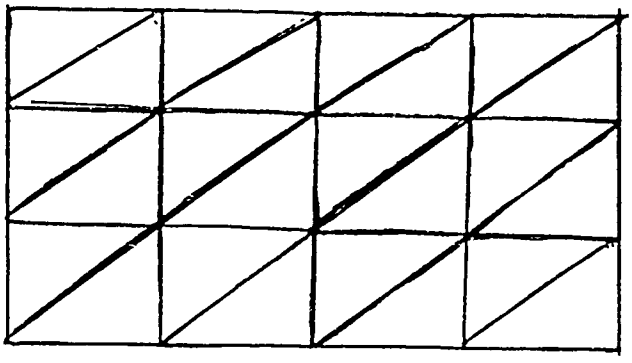
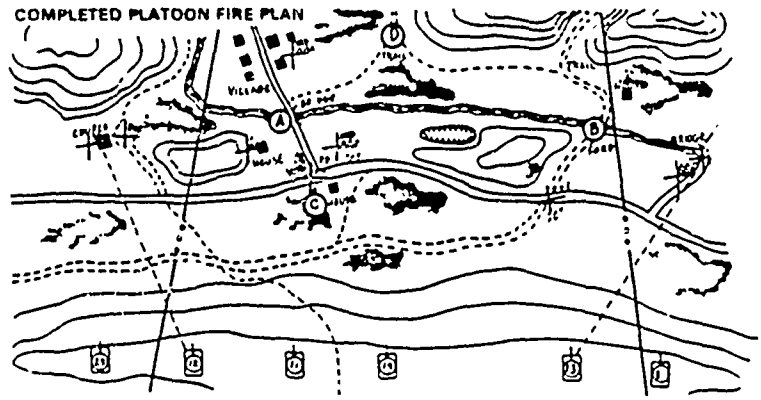


Figure 5-22. Matrix Box

5.1.2.2 Platoon Fire Plan Graphic (RANGE CARD).

A defensive fire plan consists of a sketch drawn as closely to scale as possible and a target list of direct and indirect fires. The sketch should show:

- o the platoon or element sector, or the engagement area;
- o tank positions and sectors of fire;
- o maximum engagement ranges of main gun and coax machineguns;
- o OPs;
- o TRPs with ranges (if laser rangefinder is blocked by smoke);
- o mines and other obstacles;
- o indirect fire target locations;
- o the indirect fire FPF location, if allocated, and a list of TRPs and the tanks that can fire on each; and
- o the information is locked into V(INT)^2 memory for use later.



LEGEND

TARGET	TANKS ABLE TO FIRE	TANKS TO SENSE	
			E41 Target Reference Point
			13 Tank Position
			C Platoon Targets

		Volley 1	Volley 2	
TRP E41	14,11,12	12	14	
C	14,12,11,13	12,11	14,13(section fire)	
D	13,14	14	13	001 Indirect-Fire Target

*Limit use. In any given scenario, of those tanks able to fire, one or two would sense.

Figure 5-23. Platoon Fire Sketch

Note. The parts of the defensive fire plan described are the minimum items necessary to make the plan meaningful. The unit SOP or the commander in his order may require more detail.

5.2 Drills. All drills executed by the platoon that are in direct response to the situation (METT-T) are combat drills. While drills are trained as a set of non-negotiable exercises to learn technical details of the task, they are executed with variations as the platoon leader assesses the need for flexibility. These drills may be categorized into four major classes.

5.2.1 Formation Drills. The basic functions of formation drills are to control movement speed, distribute fires, provide for security and/or negotiate terrain. The platoon leader selects formations based on his analysis of METT-T and his $V(INT)^2$ is used to monitor the execution of the drill.

5.2.1.1 There are six basic formations for the platoon:

- o Combat wedge
- o Combat column
- o Line
- o Column
- o Coil
- o Herringbone

5.2.1.2 The combat wedge will be the most commonly employed formation for tactical movement. Combat wedge advantages are:

- o Permits excellent fire to the front and good fire to each flank.

- o Allows the leaders excellent observation up front while being covered by their wingmen.

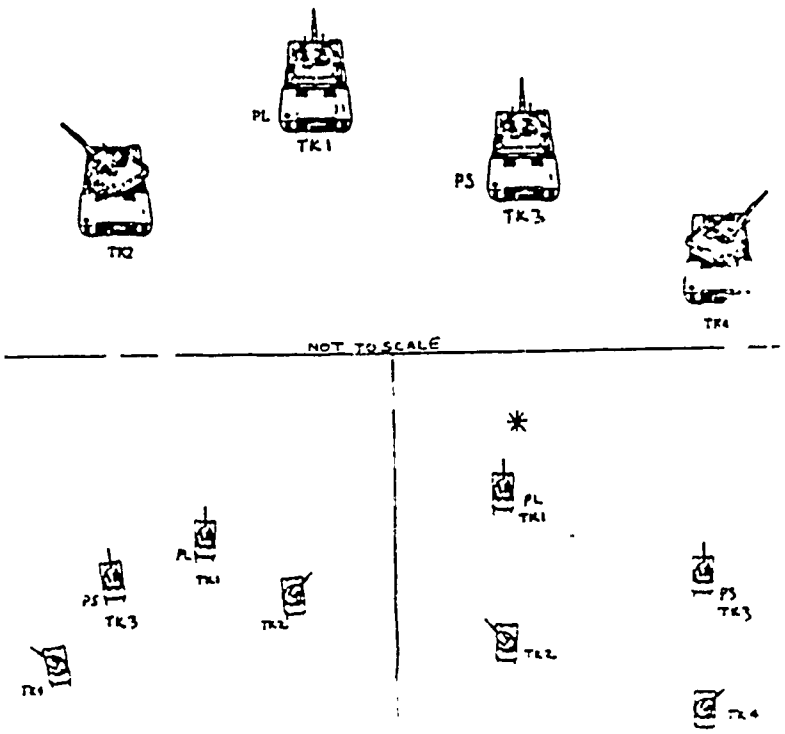
o Facilitates control since leaders are in close contact and can easily relay hand and arm signals.

o Lends itself readily to fire and movement. Wingmen follow their leaders.

Combat wedge disadvantages are:

o Requires large lateral space for movement (i.e. 300 meters or more).

o Cannot be used during periods of limited visibility due to the field of view of the drivers sight. By always moving in the same relative position within the wedge, everyone knows where to move, who is beside them, and where to observe and direct fires in combat. It provides a guide for drivers to orient on the other vehicles of the platoon. Exact vehicle location will vary based upon the factors of METT-T. The traveling technique of movement is used with this formation.



*This modification is used whenever the terrain temporarily limits trafficability to two trails.

Figure 5-24. Combat Wedge

5.2.1.3 The Combat column formation provides for excellent protection and control but limits fires to the front. The platoon leader and his wingman lead, followed by the platoon sergeant's section. This formation is used whenever weather or terrain restricts movement or overwatch within the

platoon is required. The platoon uses the traveling or traveling overwatch technique of movement with this formation.

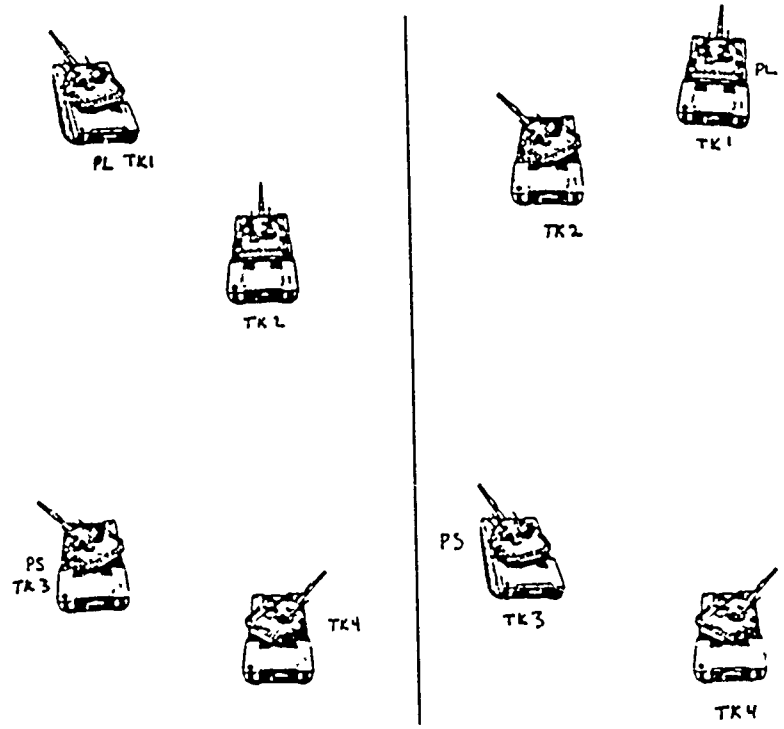


Figure 5-25. Combat Column

5.2.1.4 The line formation provides maximum firepower forward and permits the unit to cross dangerous areas in a minimum amount of time.

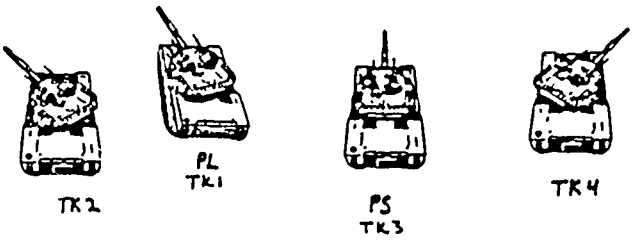


Figure 5-26. Line

5.2.1.5 The column formation provides excellent control and maximum fire to the flanks, but permits less fire to the front. The platoon leader positions himself where he can best control his elements. If he does not lead, he must make sure the lead vehicle is thoroughly familiar with the route of march. The platoon column is used when passing through defiles or dense woods and during road marches.

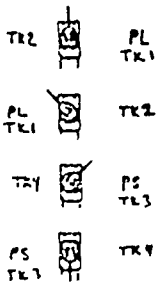


Figure 5-27. Column

5.2.1.6 The coil formation provides good all-round security during extended halts or lulls in combat. The platoon leader commands "COIL," and positions his tank. Remaining tanks position themselves based on the terrain and fields of observation.

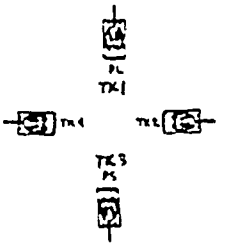


Figure 5-28. Coil

5.2.1.7 The herringbone formation is used when required to assume a hasty defensive posture from a column in cases when offensive action is not possible or appropriate. Formation should permit passage of vehicles down the center of the column. All vehicles should move completely off the road if the surrounding terrain permits.

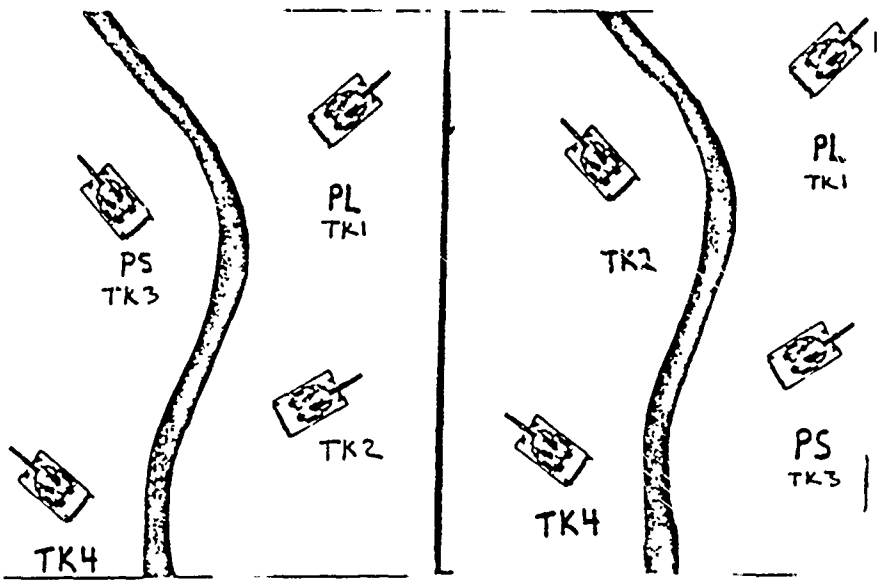


Figure 5-29. Herringbone Drill

5.2.2 CHANGE OF FORMATION DRILL. The change of formation drill is a method of moving from one formation to another with a minimum of confusion; e.g., changing the platoon's formation from Combat Wedge to Combat Column to Line must be well trained in order to be done smoothly. Figure 5-30 shows the movement of individual tanks during these moves.

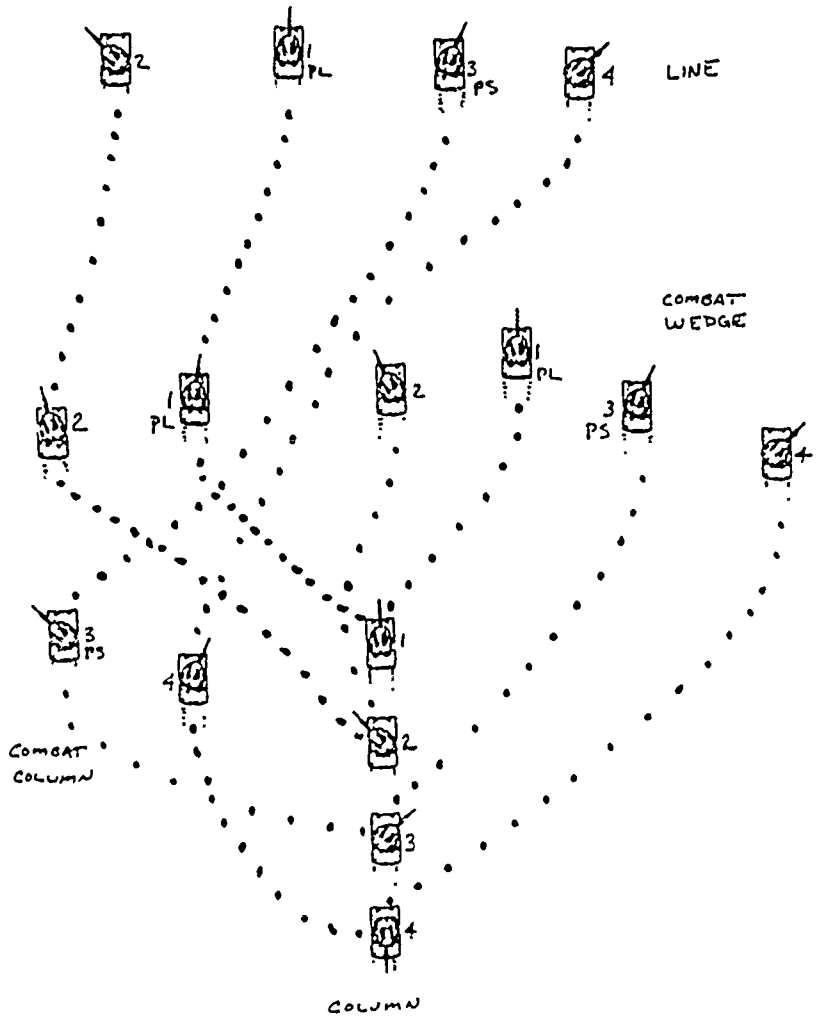


Figure 5-30. Change Formation Drill

5.2.3 ENGAGEMENT DRILLS. Engagement Drills are platoon level fire distribution exercises. The platoon leader uses TRP's, sectors, or actual target designations to distribute fires between his platoon's vehicles. The designations are transmitted to each TC via the V(INT)2. The targets

which belong to that vehicle are highlighted. In other cases the display is used as a fire plan to control fires. There are three basic engagement techniques which will cover most situations and provide fast, effective, platoon fire distribution.

5.2.3.1 Frontal fire is used when threat targets are dispersed laterally in relation to the platoon and all tanks are firing to the front. When targets are destroyed, fires are shifted toward the center.

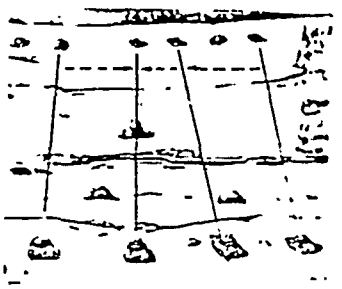


Figure 5-31. Frontal fire

5.2.3.2 Cross fire is employed when targets are exposed laterally but obstructions prevent all tanks from firing to the front. Each tank engages a target diagonal to its position and works toward the center as targets are destroyed. The advantage of cross fire is that it can be used from reverse slope positions.

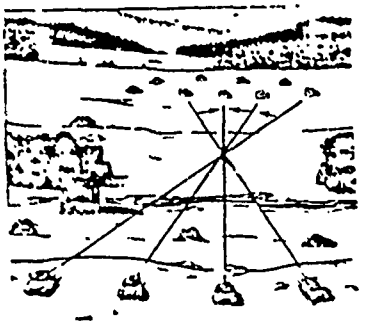


Figure 5-32. Crossfire

5.2.3.3 Depth fire is used when targets are exposed in column. The center tank engages the first target of the threat formation. Tanks to the right of center engage the nearest targets. Tanks to the left of center engage the farthest targets.

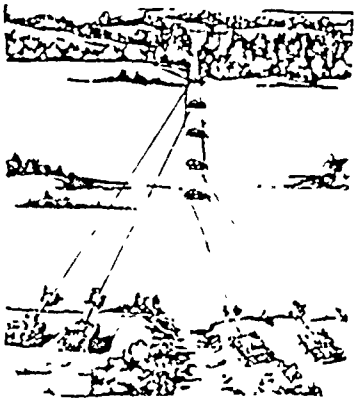


Figure 5-33. Depth Fire

No matter which drill is used, the ultimate goal is to fire into the flanks of as many threat vehicles as possible.

5.2.4 MOVEMENT DRILLS. Movement drills are broad category drills which combine formation and engagement drills with techniques of movement. These movement techniques are used as a result of the leaders weighing the trade-off between the requirement for speed and the requirement for added security during a movement to contact. Depending on the factors of METT-T, the platoon leader will use traveling, traveling overwatch or bounding overwatch. Seldom will the platoon use bounding overwatch by section since other platoons will normally provide overwatch. The V(INT)^2 allows the platoon leaders and platoon sergeant to maintain unit integrity while spending most of their time observing the terrain. The location of the platoon is automatically plotted on their V(INT)^2 map.

5.2.4.1 Traveling. The "traveling" technique is characterized by continuous movement and is best suited to a situation where enemy contact is unlikely and speed is important. When combined with the combat wedge formation, this technique allows the platoon to move rapidly and react to threats from the front or either flank quickly and decisively. Each technique may be used in both offensive and defensive situations as shown below. The primary difference would be in the intent of the commander and direction of movement. Here the advantage of the V(INT)^2 is the knowledge of enemy locations and movement.

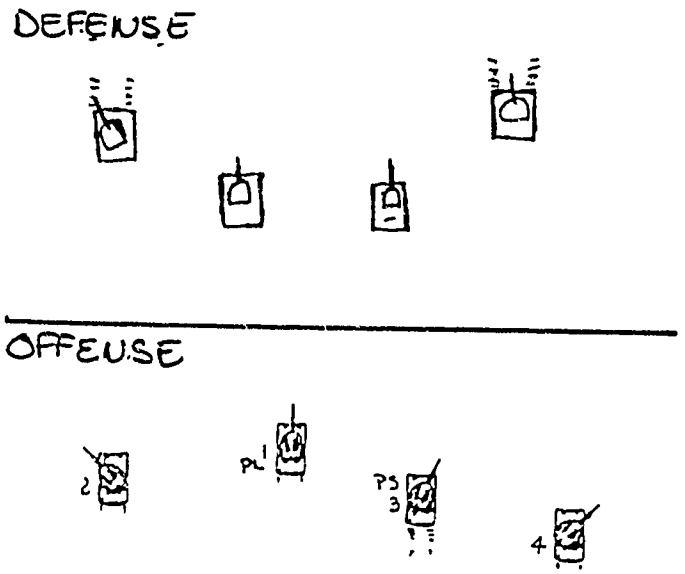


Figure 5-34. Traveling

5.2.4.2 Traveling Overwatch. The "traveling overwatch" technique is an extended form of the "traveling" technique. It is designed to provide an additional measure of security when contact is possible but speed is desired. The lead element moves continually and as rapidly as possible. The trail element moves at variable speeds and may even halt periodically to overwatch the movement of the lead element. The trail element overwatches at a distance such that enemy engagement of the lead element will not engage the trail element and prevent it from firing and maneuvering in support. In this manner, the platoon provides a small degree of overwatch protection for itself while avoiding engagement of all its elements in case of contact. Traveling

overwatch may be used not only within the platoon itself but may also be employed by platoons within the company. The combat column is the formation normally used with this movement technique.

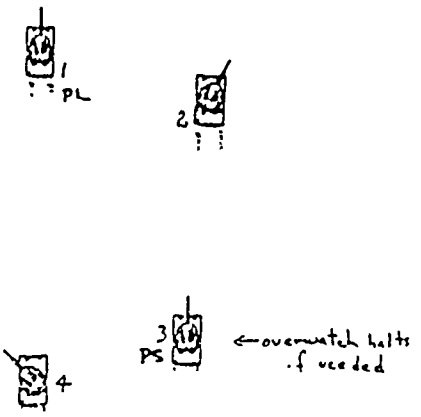


Figure 5-35. Traveling Overwatch

5.2.4.3 Bounding Overwatch.

5.2.4.3.1 Occasionally, when other platoons cannot overwatch because of terrain, and when likely contact dictates a cautious approach, "bounding overwatch" may be employed by sections. This technique is the slowest, but the most secure, since it allows the platoon to provide itself with covering fire. The overwatch element covers the progress of the lead element from a covered and concealed position. It must be ready to engage those areas from which the lead element could receive effective fire.

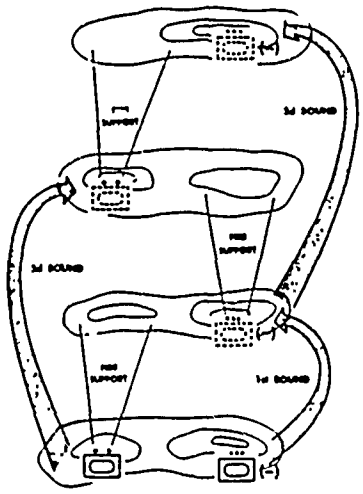


Figure 5-36. Alternate Bounds

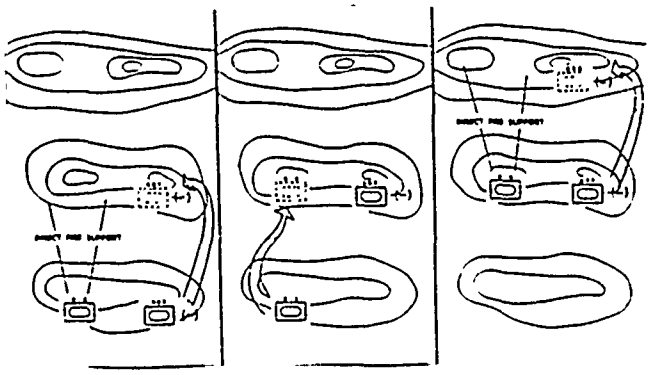


Figure 5-37. Successive Bounds

5.2.4.3.2 Overwatch positions should offer protection by cover and concealment, good observation, and fields of fire. Elements occupying overwatch positions must:

- o Visually check the security of the position.
- o Occupy hull-down firing positions.
- o Assign areas for observation and fire by the element leader.
- o Orient all weapons on known, likely or suspected enemy positions.
- o Search for targets.
- o Be alert for enemy activity. Do not conentrate on movement of bounding element.

5.2.4.3.3 CHANGE OF DIRECTION DRILLS. Often an unidentified obstacle or barrior will force the platoon leader to change or angle the movement of a formation. He can do this using a "Move Left" or "Move Right" drill.

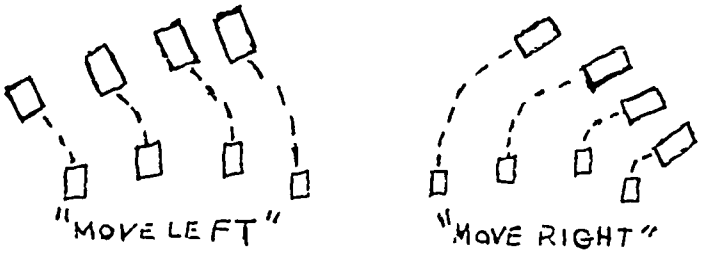


Figure 5-38. Move Left Drill and Move Right Drill

5.2.4.3.4 REACTIVE DRILLS. Reactive drills are those quick reaction exercises that are implemented on contact with an enemy force. V(INT)^2 assists the command and control of this situation by monitoring enemy locations and allowing the platoon leader to bring all his combat power to bear in the most advantageous location.

5.2.4.3.4.1 Action Drills. On the order of the platoon leader the platoon must change direction in order to react to changes in terrain or enemy situation. Normally this change occurs automatically when the platoon leader's vehicle changes direction (wingman concept). However, it can also occur on order using hand and arm signals or a radio command of "ACTION". Figure 5-39 shows the tanks relative positions during a change of direction. These drills usually require a deviation from the planned

direction of movement and are executed to attack a threat. Such actions are used only when deviations from original movement is permitted.

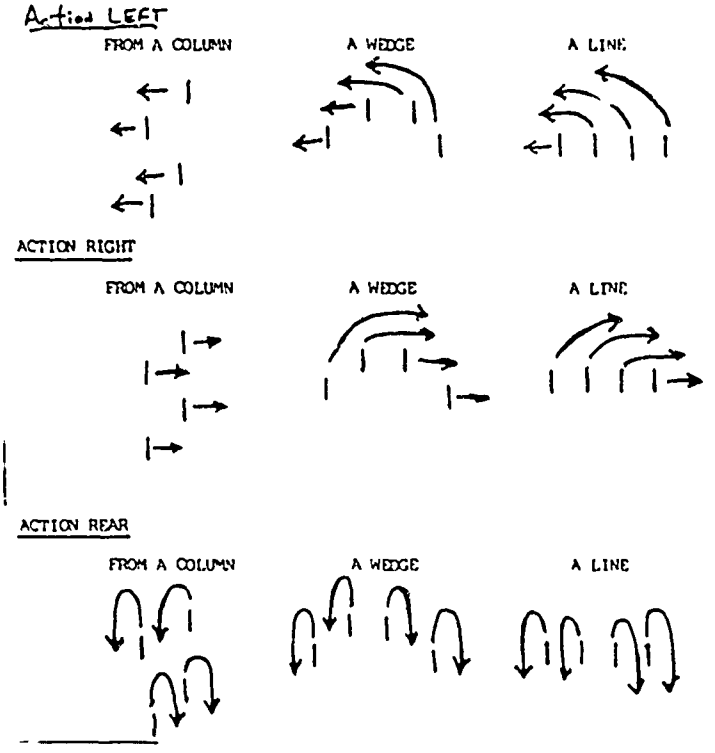


Figure 5-39. Change of Direction Drill

5.2.4.3.4.2 Contact.

5.2.4.3.4.2.1 Whenever enemy direct fire (tank or ATGM) is encountered the first reaction by each tank is to return fire and seek cover and concealment immediately, or supress and continue to move toward its objective as in an attack or withdrawal under fire. The movement may be

accompanied by the use of smoke grenades, smoke screen, and a call for indirect fire suppression.

5.2.4.3.4.2.2 The platoon is alerted to the contact (no direct fire observed) by use of the V(INT)^2, radio, or hand and arm signals. When using the radio the direction to the enemy is given. For example, if the direction of travel is north and the enemy appears 90^o to your right flank, the direction is given as right. Therefore, "Contact...right" tells all the tank commanders to turn their turrets to the right and engage the enemy. The V(INT)^2 display is least susceptible to misinterpretation. An action drill will normally follow the contact drill.

5.2.4.3.4.2.3 When radios cannot be used and when the tanks are buttoned up, wingmen watch either the V(INT)^2 or the movement of the platoon leader's tank and gun tube orientation to determine their own actions. When cover or concealment is not immediately available the platoon leader must decide the direction to the nearest cover and move the platoon to safety or into a hasty assault.

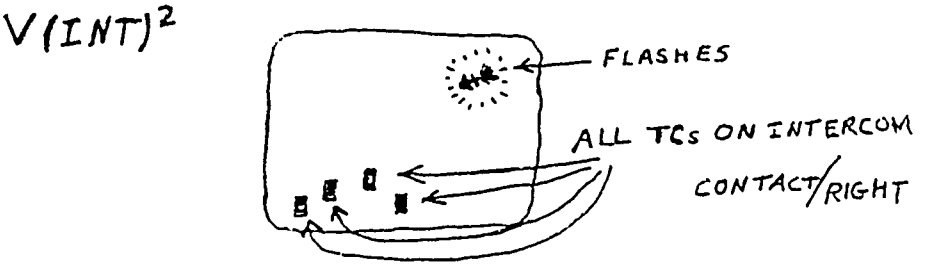


Figure 5-40. Reaction to Direct Fire Drill

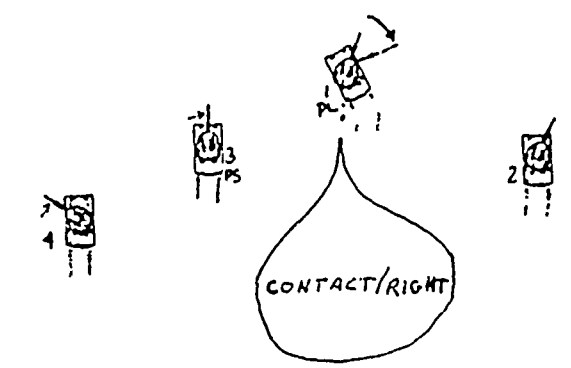


Figure 5-41. Reaction to Direct Fire Drill (Continued)

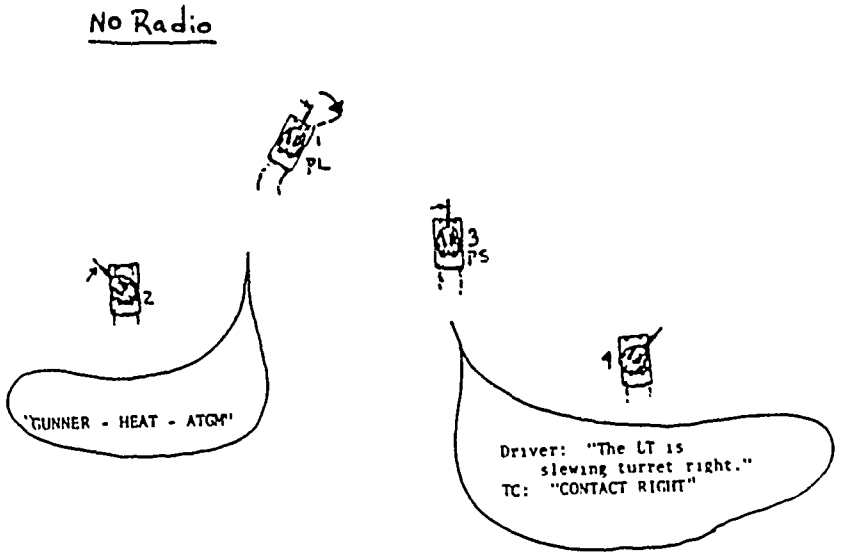


Figure 5-42. Reaction to Direct Fire Drill (continued)

5.2.4.3.4.3 Reaction to Indirect Fire Platoon Drill.

5.2.4.3.4.3.1 Reaction to indirect fire is a drill performed when the platoon comes under indirect fire while either moving or stationary. The first action of the crewmen is to close their hatches and mask if they are not already at MOPP level 3 or 4. If on the move, the platoon will maintain its speed and direction to leave the impact area as quickly as possible. V(INT)^2 eases the Platoon leader's C^2 problems in this situation since the effects of indirect fires, smoke, noise and confusion might normally cause the platoon leader to lose control of the platoon during this portion of the drill. Simultaneously, the platoon leader will send a

spot report to the company commander, and the designated NBC vehicle will begin to monitor for the presence of chemical agents. the transmission of data from these vehicles is automatic and continuous via the V(INT)^2. The NBC and IFF data is processed through the company commander's V(INT)^2 for automatic retransmission to the Bn S 2/3. If the mission requires the platoon to remain stationary, permission must be obtained from the company commander before moving to alternate positions outside the effects of the artillery.

5.2.4.3.4.3.2 Once clear of the indirect fire effects track crews may open their hatches, but must remain masked, until the "all clear" is given by the platoon leader. If radio antennas are damaged, they may need replacement by either spare or field expedient antennas.

5.2.4.3.4.4 Reaction to Air Attack Platoon Drill.

5.2.4.3.4.4.1 The best defense that a tank platoon can mount against an air attack is a passive defense. Use of camouflage, cover and concealment will frequently prevent high performance enemy aircraft and helicopters from detecting the platoon. If aircraft cannot detect the platoon, then they cannot attack it. The V(INT)^2 will not normally show sufficient range for advance warning and tracking of aircraft so the symbol for both attack helicopters and high performance aircraft are alerts as to direction and probable path. The V(INT)^2 would depict this information as

shown in figure 5-43. As attack helicopters enter actual display their symbols would be shown as are other vehicles. When a vehicle is designated "air guard" it receives information direct from and transmits to bn ADA Assets. Air attack alerts are transmitted to units within the projected path of flight.

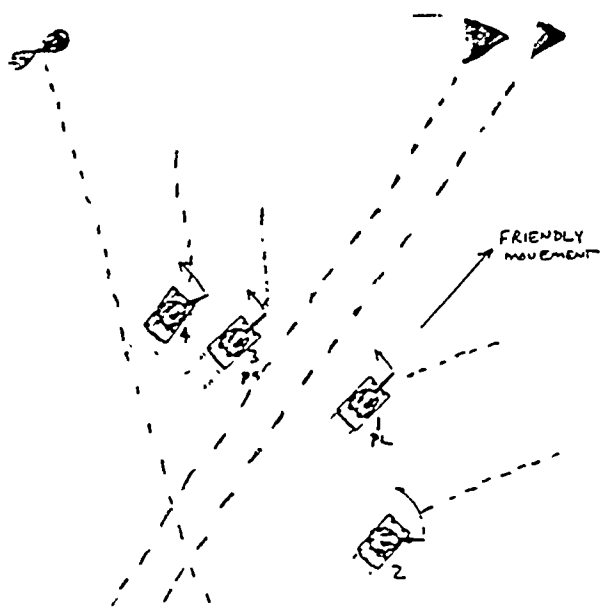


Figure 5-43. Direction of Movement.

5.2.4.3.4.4.2 The drill involves four steps; alert the platoon, seek cover and concealment, prepare to engage, and report.

o The air guard, designated by SOP, can alert the platoon using three techniques. Transmitting the alert by V(INT)2, announcing "AIR ATTACK (direction)" over the radio or using arm and hand signals.

o When moving, units must immediately and automatically seek cover and concealment upon receipt of the alarm. If concealment is not available a motionless vehicle is harder to see than a moving vehicle. Warning, premature use of smoke to hide the vehicle may alert an otherwise unalert pilot to your presence. However, once the enemy aircraft initiates its attack, a motionless tank is easier to hit. Exposed tank units that are attacked must move at a 45^{o} angle towards the attacking aircraft to reduce his ability to hit you. Vehicles should maintain at least 100 meter interval, avoid presenting a linear formation with respect to his direction of attack and move at maximum possible speed while retaining platoon integrity. The attack angle is automatically projected on the platoon leader's and platoon sergeant's $V(INT)^{2}$ when "air attack" is broadcast.

o Track commanders and loaders (if equipped with a loader's station machinegun) should prepare to engage the aircraft on order of the platoon leader with a high volume of fire from their machineguns. The platoon leader may also designate an aiming point for the platoon with a burst of tracers. Remember, volume is the key. Throw up a wall of fire and let the aircraft fly through it. Since firing machineguns could reveal the location of concealed vehicles, the platoon leader must make sure the aircraft is attacking, and that concealment is not effective.

o The tank main gun can be effectively used against enemy attack helicopters with a high probability of kill. The $V(INT)^2$ is used by the platoon leader to determine which vehicles will engage targets.

5.2.4.3.4.4.3 If the platoon is engaged by bombs or spray, the reaction to indirect fire drill is used to button up, mask, and commence monitoring.

5.2.4.3.4.4.4 Enemy aircraft operate in sets of two, four, six or more. Although the first aircraft may pass overhead, another may follow closely. Do not move from your covered and concealed positions for at least 30 seconds after the first aircraft departs.

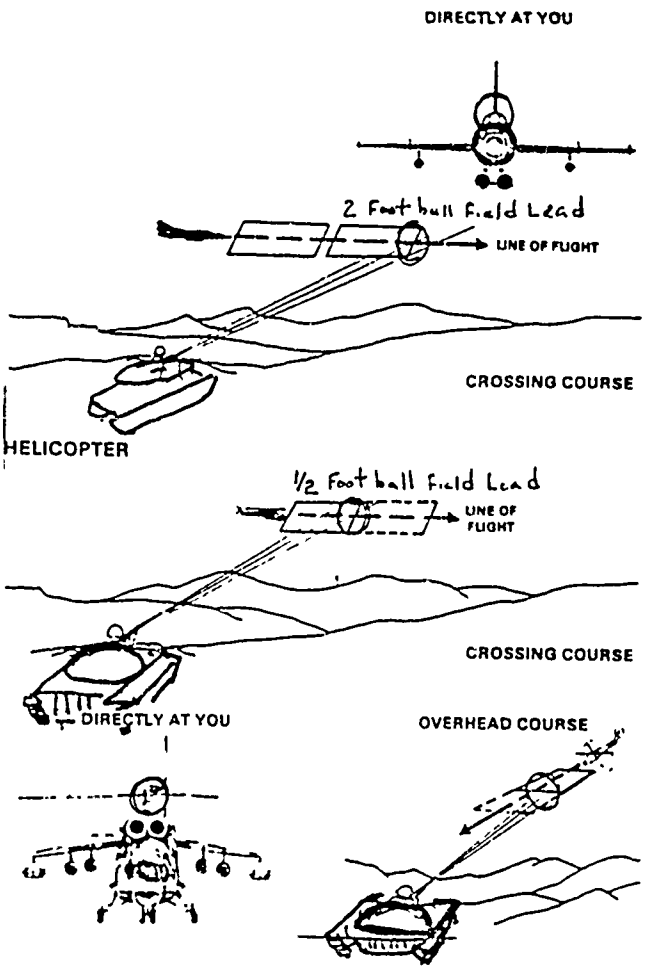


Figure 5-44. Lead

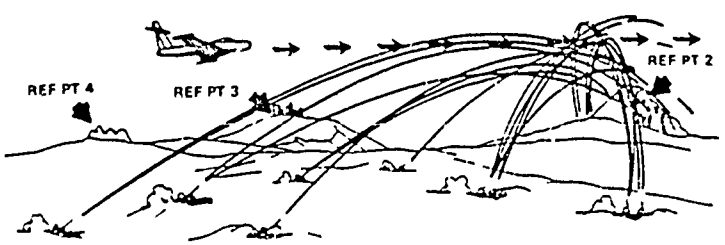


Figure 5-45. Aim Point

5.3 Platoon participation in tactical operations. Once the tools (drills) of the platoon have been learned, the platoon leader implements them in a company tactical scheme of maneuver. The company commander prepares for the company offensive/defensive missions through situational training exercises which mix drills and collective tasks in combinations which support the company mission. For more information on training see the battalion section.

5.4 Continuous Operations.

5.4.1 The maintenance of minds and bodies of soldiers is as important as the maintenance of the equipment. An effective sleep plan must be incorporated in the platoon's SOP to complement the maintenance plan. Depending on the threat, the platoon may establish a minimum alert condition (less than 10% of the platoon awake), a maximum alert condition (100% of the platoon awake; e.g., STAND-TO), or any degree of alertness in between. The leader must consider the threat, whether enemy patrols are expected, the requirement for sleep by his soldiers and whether terrain will permit security of the platoon by a reduced number of personnel. Warning orders must include order issue and movement time so that leaders and crew alike can schedule sleep. Crews will often sleep on their vehicles. Using the $V(INT)^2$ sensors to provide early warning and reduce their vulnerability to NBC attack or conventional artillery.

5.4.2 Planning and decision making skills are more degraded by lack of sleep than physically oriented tasks. Therefore, leaders are more susceptible to the effects of a lack of sleep than their soldiers. The platoon SOP must insure an adequate division of duties to allow leaders to get sleep. This may require the platoon leader, platoon sergeant and one or both of the other track commanders to share those duties. The command function will be transferred from the platoon leader's vehicle to the platoon sergeants vehicle when duties are transferred.

5.5 Logistical Support

The platoon does not provide for its own logistical support. On board sensors provide data to the battalion logistical center. The platoon leader and platoon sergeant have access to this information and receive a status report of the platoons ammunition, POL, and maintenance. They can also "call up" information concerning resupply and maintenance points, when needed. Monitoring logistics is normally the platoon sergeant's responsibility, but becomes a shared duty during continuous operations. The Battalion SOP will establish operating levels of Red, Amber, and Green for all logistical information. These levels will be converted from $V(INT)^2$ data and automatically displayed for quick reference to leaders on their $V(INT)^2$. The quick reference display flashes.

		Ammo	POL	Maintenance
	Green	80%	90%	All operational
SOP=	Amber	60%	70%	75% operational
	Red	40%	50%	50% operational

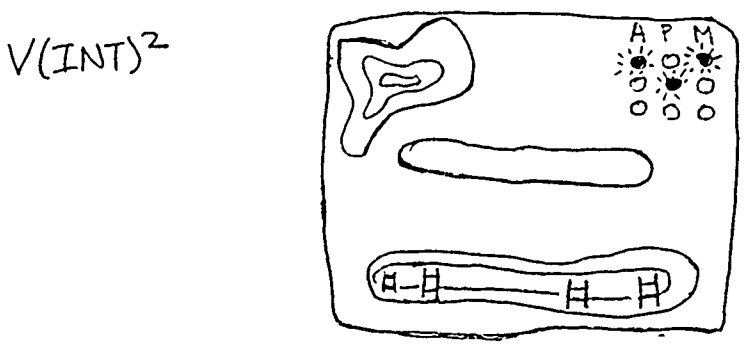


Figure 5-46. SOP converted to V(INT)^2 display

for a predesignated length of time when a status changes or it can be requested by the platoon leader/sergeant. A more detailed logistics display can be displayed on request. The V(INT)^2 monitors the platoon status and alerts the leaders when levels become critical. This is normally signalled to the platoon sergeants V(INT)^2 first and then if not acknowledged to the platoon leader. The V(INT)^2 recommendations on cross leveling can be

overriden by the platoon leader based on the tactical situation. The platoon status is automatically transmitted through the company XO and Cdrs V(INT)^2 to the Admin/Log Center for the necessary request and resupply actions.

5.6 Limitations.

The platoon leader/sergeant have access to all information pertaining to the platoon including designated logistical support. The V(INT)^2 will not provide overall company mission data, or data pertaining to other platoon elements except when the company commander provides demand input data to change a mission (Bn Chapter Information Limitations). The platoon can direcly contact any unit within its area of influence (6 km) but can not net directly to Battalion V(INT)^2 command channels or receive company level intelligence information from vehicles outside that area. This limitation is for both technical and tactical reasons. The most important tactical reason is to limit the amount of information that a platoon receives to that which can be immediately and effectively used.

V. CREW

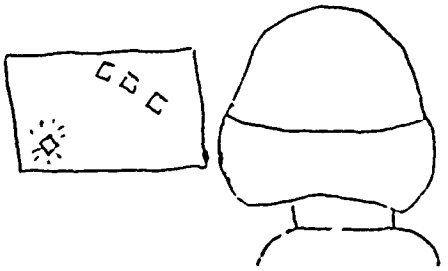
The Armored Fighting Vehicle (AFV) crew performs four major functions in battle, which are to see, move, shoot, and communicate. The AFV will not operate as an independent vehicle, and the smallest operational element is a two-vehicle section. The normal operation of the section is as part of the platoon. The AFV uses the V(INT)^2 to enhance its combat capabilities in each of the four areas.

6. Functions of a Track Commander's V(INT)^2

6.1 SEE. The AFV sees the battlefield through visual and sensor inputs. The track commander's v(INT)^2 allows the track commander (TC) to call up any digital map of the area of operations. The vehicle's on-board computer allows the TC to identify impassable terrain, obstacles, choke points, and likely routes which offer the best cover and concealment. The V(INT)^2 can identify potential traffic conjestion allowing the TC to adjust speed, thus increasing overall vehicle dispersion. Transition from one formation to another is accomplished smoothly and relative positions are maintained by checking friendly vehicle locations. The TC can "see" his relative position to vehicles on his left or right. Once the V(INT)^2 has been given the parameters (items of tactical interest) for display and ranges desired, the V(INT)^2 allows the TC to see enemy vehicles and aircraft in sufficient time to

engage, evade, seek cover/concealment, or provide early warning to the platoon.

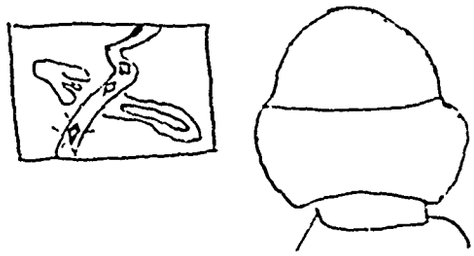
6.2 MOVE. The ability to move is closely related to the ability to see. Movement is enhanced by the ability to use the V(INT)2 map system, increasing or decreasing the scale of the map as needed to provide sufficient detail about trafficability, slope, available cover and concealment. Speed during convoy-type operations and relative positions in formations is maintained through a visual display of the friendly elements on the map. Movement to and from ammunition, POL, Class 1, decontamination points, and URP's is enhanced by the visual display of possible routes to exact locations of those classes of supply. The S4 or S1 can identify equipment and personnel pickup



TC: "Driver move up. We're falling behind."

Figure 6-1

points which would allow TC's to, on order, replace shortage items using multiple pickup points for each unit.



TC: "Driver, move right. We have a choke point ahead."

Figure 6-2

6.3 SHOOT. The Track Commander's primary responsibility is to engage and destroy the enemy.

6.3.1 IFF. The V(INT)^2 system provides a friend or foe recognition system which helps relieve the pressure (combat stress) on the track commander. The individual TC's area of interest extends to the expected range of enemy ground and air direct fire weapons (5-6,000m). A specific vehicle may be designated as an Air Guard with the sole mission of protecting the unit from air attack; in which case, he concentrates on air targets with appropriate munitions. The more common mission which is discussed in subsequent paragraphs is to engage ground targets as a member of the platoon.

6.3.2 DIRECT FIRE. The track commander receives his fire commands from the platoon leader or the section leader. The command may be to

engage targets of opportunity as they appear or as part of a platoon directed engagement pattern. Platoon fire commands are normally executed as engagement drills for cross, depth, or frontal fires.

TYPE	CONTROLLED BY	SELECTION OF GROUPS OF TARGETS	SELECTION OF INDIV TARGETS
Tgt of Opportunity	TC	TC	TC/Gunner
Platoon Engagement Drills	Plt Ldr	Plt Ldr	TC
Company Engagement Drills	Co Cdr	Co Cdr	Plt Ldr/TC

ENGAGEMENT TECHNIQUES

6.3.2.1 TARGETS OF OPPORTUNITY. When given freedom to engage targets of opportunity, the track commander uses the decision logic programmed into the V(INT)^2 to assist in the selection of targets to engage. The V(INT)^2 provides early warning of enemy forces (through scanning of optics, sound detection, movement, or other sensor means). When the enemy weapon system enters maximum range, the system recognizes the system as friend or foe (IFF) and determines its type; e.g., tank, PC, truck, helicopter. The V(INT)^2, using preprogrammed logic and sensor data assesses speed, angle of movement, and elevation to determine targets which have the highest probability of kill. The following situation describes how that engagement is planned and executed:

EXAMPLE: Choosing Targets to Engage.

TC.

A predesignaged priority of targets (received from company commander's OPORD) is input to V(INT)2. In this case, ATK helicopters, tanks, ADA, BMP's are given priorities 1, 2, 3, and 4. Other targets will be ranked 5.

V(INT)2.

As enemy force enters sensor range, all targets are displayed, up to 10, with a target letter or number designator. The highest priority targets having the highest probability of kill are given the first letter starting with "A" or "1".

TC.

The TC may choose to destroy all targets in sequence as shown on his V(INT)2 or he may engage in order of immediate danger to his vehicle using the main gun. The most likely choice is to follow the engagement sequence dictated by the V(INT)2 but also use his own weapon or subsystem to suppress or temporarily disable the optics of the most dangerous until he can achieve the proper angle to destroy it. V(INT)2 can assist in all these actions. Should a situation arise where a lower priority target must be destroyed (e.g. ADA weapons due to the arrival of friendly air)

the TC simply overrides the decision logic of V(INT)^2 and engages the target.

V(INT)^2.

When the V(INT)^2 receives new information that a higher priority target has entered the TC area of interest, it will flash or highlight the data on the screen, alerting him to the danger. (See Gunner's Station Function.)

6.3.3 INDIRECT FIRE. The track commander often finds himself in a position where he must call for indirect fire. The V(INT)^2 is a valuable tool to assist in this process. The TC need only identify which target reference point or artillery target from the company target list he needs to call and the V(INT)^2 will transmit position, azimuth, target number, and type target to the supporting artillery unit. The company FIST and Battalion Fire Support Officer monitor and have immediate access to this information and can change, cancel, or permit the fire mission to take place. The TC adjusts fire by indicating on his V(INT)^2 the location of the strike of the round. Adjustments are calculated and transmitted by the V(INT)^2.

6.4 COMMUNICATE. The problems of communication on the battlefield are significantly reduced by V(INT)^2. Communication of specific locations, target identification and platoon fire commands are handled using the V(INT)^2

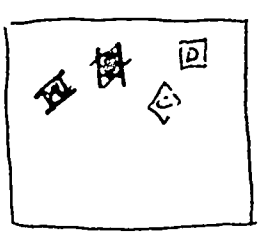
device. Burst transmission reduces the danger of triangulation by enemy fire and increases survivability. Each vehicle's on-board sensors are tied into the system so that fuel levels, ammunitions expended, and even major component malfunctions are transmitted to the battalion TOC and trains. The S4, BMO, maintenance or recovery teams, and support platoon leaders can locate the vehicle needing logistical and/or maintenance support from its last known position. The V(INT)^2 has an energy rechargeable battery pack which provides for up to 8 hours of continuous operation even when the vehicle is without electrical power. This capabiity allows for silent observation and communication of preplanned messages or locations by scouts, OP's/LP's, forward deployed or ambush vehicles. The use of preplanned messages and message formats make spot reports, shellreps, NBC reports, and similar requirements easy to remember and use. The TC "calls up" the message format, adds information, and the V(INT)^2 transmits the data. Or, in the automatic mode, V(INT)^2 transmits the data (in proper format) automatically freeing the TC for other duties.

7. THE FUNCTIONS OF A GUNNER'S V(INT)^2. The gunner uses his V(INT)^2 as an additional control measure to acquire and engage targets and is limited to the information needed to enhance that mission.

7.1 ORIENTATION. The gunner's V(INT)^2 indicates areas of engagement, area of responsibility, azimuth, and elevation as needed or on call. A

direction indicator shows the relationship of the main gun to the hull which helps the gunner maintain his orientation regardless of external conditions. It also allows the gunner to protect his optics with ballistic shields or in defilade hide positions until he is ready to engage the enemy.

7.2 SELECTING TARGETS. Unless the TC has changed the engagement, the gunner follows a target of opportunity engagement sequence within the areas he has been given primary responsibility. Targets are engaged in letter or number sequence, from A to J, with flashing targets engaged immediately. Targets are matched with gunner sight (primary) and are removed from V(INT)^2 display or marked when a target is killed. Examples of the gunner's display are as follows:

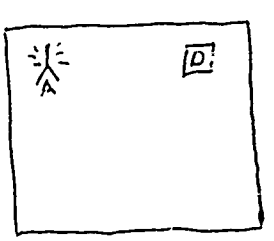


A = TANK moving at angle

B = TANK Frontal Engagement

C = APC

D = Truck



A = Attack Helecopter in Area

(new) (Old A, B, + C destroyed)

D = Truck

8. THE FUNCTION OF THE DRIVER'S V(INT)2.

8.1 ORIENTATION. The V(INT)2 is primarily a driver's map and obstacle guide. This display can identify changes in the terrain which will restrict the movement of his vehicle. Two small displays indicate direction or azimuth from magnetic north and the relative position of the vehicle to the platoon. These positions are plotted on the map as a driver's guide for movement.

8.2 MAINTENANCE GUIDE. The driver's V(INT)2 also includes a series of maintenance and trouble shooting checklists as part of its BITE which will assist the driver in actual operation of the vehicle. All sensors which indicate a maintenance problem will display a warning light which will "read out" when called up by the driver.